

III.

John E. Fogarty International Center for Advanced Study in the Health Sciences

INTRODUCTION

The John E. Fogarty International Center for Advanced Study in the Health Sciences (FIC) promotes and supports scientific research and training internationally to reduce disparities in global health. It has been a critical component of the National Institutes of Health (NIH) international research effort since 1968, when it was established by Executive Order and congressional action. The idea of a center at the NIH with the responsibility to advance health through international scientific cooperation was conceived by Congressman John E. Fogarty of Rhode Island, in whose memory the Center is named. Congressman Fogarty understood that “just as disease knows no boundaries, so also the benefits of medical research and indeed research itself can know no boundaries.” Thus he envisioned a center at the NIH “dedicated to international collaboration and the health of mankind.”

FIC is carrying this vision into the 21st century, responding to today’s critical global health challenges and working to make the results of scientific discovery available to all peoples in all parts of the world. While supporting the conduct of needed research in priority global health areas, FIC invests in human capital, building research capacity in the poorest nations of the world where the need is the greatest and resources are the least. Conscious of the fact that the poorest of the world’s population bear the greatest burden of illness and premature death, the Center promotes an ambitious program aimed at redressing these inequities through international research and training programs, research grants, and fellowships.

In addition, FIC serves as the focal point at the NIH for analysis of international scientific and health issues. In keeping with its title as a center of advanced studies, FIC undertakes, reviews, and conducts research in critical areas. Working with NIH partners, other agencies of the U.S. Government involved in international health, U.S. univer-

sities, lending institutions, and national and international nongovernmental foundations and research organizations, FIC has established programs that develop independent investigators and sustainable research enterprises in developing and middle-income countries, while encouraging multidisciplinary, collaborative research partnerships. Working in more than 100 countries and through more than 120 U.S. universities, these programs have built critical on-the-ground expertise necessary to design and conduct clinical trials, to develop interventions of benefit to U.S. and foreign communities, and to inform public health policies.

Adapting research advances in biomedicine to populations both abroad and at home requires a continuing commitment to basic science, as well as rigorous clinical and applied studies. FIC is forging collaborations with a range of domestic and international partners in international research and training to pursue three core objectives:

1. to accelerate the pace of discovery and its application by enabling scientists worldwide to share conceptual insights, analytic methods, data sets, patient cohorts, or special environments;
2. to help develop a cadre of highly capable young foreign investigators positioned to cooperate with U.S. scientists in areas of the world that, because of geography, population structure, or disease burdens, provide unique opportunities to understand disease pathogenesis, anticipate disease trends, or develop interventions; and
3. to engage and assist both young and established U.S. scientists to address scientific challenges related to global health.

These objectives form the basis for current FIC research and training programs, which span a range of global health challenges. Among these are human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS); the increasing threats of tuberculosis, malaria, and other emerging infectious diseases; population and health;

environmental and occupational health; maternal and child health; and the global burden of disease due to mental health problems and tobacco use. FIC also works to build capacity in the developing world in areas that underpin the research enterprise, including medical informatics, bioethics, and related disciplines of clinical, operational, and health service. In addition, FIC provides support to teams of NIH-funded U.S. scientists and their colleagues in the developing world through grants that enable scientists to share insights and methods in all areas of biomedical and behavioral research and through grants that are specifically targeted to issues that require global strategies. Prominent among these are grants that support (1) international studies to explore the links between health and economic development; (2) international cooperative efforts to discover therapeutic agents from natural products while fostering conservation; and (3) the Ecology of Infectious Diseases Initiative, an interdisciplinary, interagency program that is examining habitat and biodiversity changes to discover their possible relationships with the convergence of infectious disease outbreaks. In addition, career-development fellowships are stimulating young U.S. scientists committed to international research to work at centers of scientific excellence in developing countries. The challenges to reducing the stark disparities in health among the world’s people are great, but with our partners, we can bring to bear the resources necessary to find practical solutions to improve the health of U.S. and global communities.

EXTRAMURAL RESEARCH

In fiscal year 2000 (FY 00), FIC supported 17 programs that advance research and build research capacity. Descriptions and some accomplishments achieved under these programs are presented here.

TABLE III-1.**AIDS International Training and Research Program, Fiscal Year 2000**

Principal Investigator/Institution	Major Collaborating Countries/Areas
Dr. Salim Abdool Karim Columbia University New York, N.Y.	Botswana, Lesotho, Namibia, South Africa, Swaziland
Dr. Adaora A. Adimora University of North Carolina, Chapel Hill Chapel Hill, N.C.	Cameroon, China, Malawi
Dr. Chris Beyrer Johns Hopkins University Baltimore, Md.	Brazil, China, Democratic Republic of the Congo, Dominican Republic, Ethiopia, Haiti, India, Laos, Malawi, Malaysia, Russia, Thailand, Uganda
Dr. William A. Blattner University of Maryland Baltimore, Md.	Barbados, Brazil, Caribbean, Nigeria
Dr. Jack A. DeHovitz State University of New York Brooklyn, N.Y.	Czech Republic, Hungary, Poland, Russia
Dr. Carlos del Rio Emory University Atlanta, Ga.	Armenia, Georgia, Mexico, Vietnam
Dr. Roger Detels University of California, Los Angeles Los Angeles, Calif.	Cambodia, China, India, Indonesia, Laos, Thailand, Vietnam
Dr. Max Essex Harvard University Boston, Mass.	Botswana, Senegal, Tanzania, Thailand
Dr. John L. Fahey University of California, Los Angeles Los Angeles, Calif.	Brazil, China, India, Mexico, Thailand, Vietnam
Dr. Alejandra C. Gurtman Mt. Sinai School of Medicine New York, N.Y.	Argentina
Dr. Lee H. Harrison University of Pittsburgh Pittsburgh, Pa.	Brazil, India
Dr. Warren D. Johnson, Jr. Weill Medical College Cornell University Medical College New York, N.Y.	Brazil, Haiti
Dr. Mark W. Kline Baylor College of Medicine Houston, Tex.	Botswana, Mexico, Romania, South Africa
Dr. Joan Kreiss University of Washington Seattle, Wash.	Kenya, Mozambique, Peru, Thailand
Dr. Judith A. Levy University of Illinois Chicago, Ill.	Chile, Indonesia, Malawi
Dr. Kenneth Mayer Brown University Providence, R.I.	Bangladesh, Cambodia, India, Indonesia, Philippines
Dr. Michael H. Merson Yale University New Haven, Conn.	China, India, Russia, South Africa

International Research and Training Grants**AIDS International Training and Research Program**

Through the AIDS International Training and Research Program (AITRP), FIC sponsors U.S. schools of medicine, nursing, and public health to train foreign scientists from developing countries through a variety of options. Training is designed to provide the skills required to address the global HIV/AIDS epidemic and the related tuberculosis epidemic through research. AITRP helps (1) to establish critical expertise in biomedical and behavioral science in developing countries affected by HIV/AIDS and tuberculosis; (2) to facilitate new research efforts in prevention that supplement or complement studies on AIDS and tuberculosis supported by the NIH and other U.S. agencies; (3) to establish long-term cooperative relationships between U.S. and foreign research groups; and (4) to support cooperation between U.S. academic research centers and foreign scientists. Training is linked to ongoing prevention research in developing countries and emerging democracies that is supported by the NIH and other organizations.

In FY 00, a Request for Applications (RFA) for recompetition of AITRP resulted in six new grants, three competing renewal grants, and 33 competing supplements to 11 of the 14 existing grants. These awards were made possible by collaborative funding from the NIH's National Cancer Institute (NCI), National Institute of Dental and Craniofacial Research (NIDCR), National Institute on Drug Abuse (NIDA), National Heart, Lung, and Blood Institute (NHLBI), National Institute of Mental Health (NIMH), and National Institute of Nursing Research (NINR) and in cooperation with the NIH Office of AIDS Research. The competing supplements focused on research training to support geographic expansion to China and India; safety of the blood supply for transfusions; identification and treatment of AIDS-related malignant conditions; expanded international grants from the Center for AIDS Research, of the National Institute of Allergy and Infectious Diseases (NIAID), which are linked to AITRP grants; and AITRP grantees with links to NIMH Popular Opinion Leader studies. In FY 00, AITRP supported 25 pro-

TABLE III-1. Continued**AIDS International Training and Research Program, Fiscal Year 2000****Principal Investigator/Institution Major Collaborating Countries/Areas**

Dr. Vinayaka R. Prasad Yeshiva University Albert Einstein College of Medicine Bronx, N.Y.	Eritrea, India
Dr. Arthur L. Reingold University of California, Berkeley Berkeley, Calif.	Botswana, Brazil, China, Côte D'Ivoire, Dominican Republic, Peru, Thailand, Vietnam, Zimbabwe
Dr. Gwendolyn B. Scott University of Miami Miami, Fla.	Brazil, Haiti, Romania, Zambia
Dr. Gail Shor-Posner University of Miami Miami, Fla.	Colombia, Dominican Republic, Guyana, Honduras, Jamaica, Peru, Zambia
Dr. Sten H. Vermund University of Alabama Birmingham, Ala.	Bangladesh, China, India, Mongolia, Pakistan, Russia, Zambia
Dr. Christopher Whalen Case Western Reserve University Cleveland, Ohio	Kenya, Uganda
Dr. Charles Wood University of Nebraska Lincoln, Neb.	Zambia
Dr. Susan Zolla-Pazner New York University New York, N.Y.	Cameroon, India

grams in 51 major collaborating countries and the Caribbean (Table III-1).

AITRP is now the single largest global training program for HIV and AIDS research. Since its inception, more than 2,000 scientists from more than 100 countries and territories have trained in the United States, most of these at the postdoctoral or doctoral level, and approximately 50,000 students and health professionals have participated in some 700 short-term training courses in 65 countries. Examples of contributions by AITRP fellows are presented here.

HIV Transmission Through Breast-feeding

After the announcement in FY 99 that a single dose of the antiretroviral drug nevirapine given to HIV-infected mothers in labor and a single dose given to their newborns reduced HIV transmission, attention turned to the transmission of HIV through breast milk. The risk of such transmission has been documented in observational studies, but estimates for the proportion of HIV infection in newborns due to breast-feeding have varied considerably (5%–25%). Better estimation of the incidence of infection and

improved understanding of the factors that influence HIV transmission through breast milk are vital to the survival of many infants in resource-poor countries.

In a study in Kenya by AITRP fellows at the University of Nairobi and scientists at the University of Washington, Seattle, pregnant women infected with HIV were randomly assigned to breast-feed their infants or to feed them formula. Infants born to mothers in the breast-feeding group were more likely to become infected with HIV (37%) than infants born to mothers in the formula-feeding group (21%). Forty-four percent of the HIV infections in the infants born to mothers in the breast-feeding group were due to the presence of HIV in breast milk, and most of these infections occurred within the first 6 months of life. The risk of dying by 2 years of age was the same for infants in both groups. Formula feeding appears to be the best choice for HIV-infected women to prevent HIV transmission through breast milk, but breast-feeding is the social, cultural, and economic norm in many resource-poor countries, and changing this norm will be difficult. Where-

as 96% of the mothers in the breast-feeding group actually breast-fed their infants, 30% of the women in the formula-feeding group also used breast-feeding. Additional studies are under way to address the related and complex social and economic implications of infant feeding and to determine the effects of breast-feeding only and of mixed feeding (breast-feeding plus feeding of formula or foods) on the rates of HIV transmission through breast milk.

Emerging HIV Epidemic in China and Russia

AITRP trainees and investigators from China and Russia, working with investigators at the University of California, Los Angeles, and the University of Wisconsin, Madison, respectively, are undertaking studies to elucidate the context of the emerging HIV epidemic in their countries. Although Russia is experiencing one of the sharpest increases of HIV incidence in the world, little research has been done to increase understanding of the population's knowledge and perception of HIV infection and to document risk behaviors for this disease and other sexually transmitted diseases (STDs).

In China, the reported routes of HIV transmission have focused on intravenous drug use and unsafe blood in transfusions. However, heterosexual transmission of HIV is increasing and will become the dominant mode of transmission if the epidemic is left unchecked. A study conducted by AITRP investigators from the Yingshang County Anti-Epidemic Station, Yingshang, and Anhui Provincial Anti-Epidemic Station, Hefei, and their colleagues at the University of California, Los Angeles, examined sexual behaviors among rural residents aged 15–49 years in eastern China. More than 70% of the men and 50% of the women surveyed had heard about HIV/AIDS but, of these, fewer than 6% thought they were at risk of infection. High-risk sexual behavior, such as premarital sexual activity, multiple partners, a history of STDs, and oral and anal sex, were increasingly common among young respondents (aged 15–24 years). Another study documented HIV prevalence of 12.5% among former commercial donors of blood plasma, and prevalence increased as the frequency of blood donation increased. HIV prevalence among spouses who did not donate blood was 2%, which suggests a

TABLE III-2.**Actions for Building Capacity in Support of International Collaboration in Infectious Disease Research Program, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus
Dr. Barry Beaty Colorado State University Fort Collins, Colo.	Mexico CINVESTAV-IPN Universidad de Nuevo León Universidad de Yucatán	Dengue Dengue hemorrhagic fever Molecular and population genetics of vectors Vector-borne diseases
Dr. John Beier Tulane University New Orleans, La.	Kenya International Centre of Insect Physiology and Ecology Kenya Medical Research Institute Ministry of Health (Division of Vector-Borne Diseases)	Malaria Medical entomology Population genetics Vector ecology and behavior
Dr. Michael Bennis New England Medical Center Hospital Boston, Mass.	South Africa Africa Center for Population and Reproductive Health Medical Research Council of South Africa University of Natal School of Medicine	Bacteriology Parasitology Virology
Dr. Stephen Calderwood Massachusetts General Hospital Boston, Mass.	Bangladesh International Centre for Diarrheal Disease Research	Epidemiology Immunology
Dr. Richard Chaisson Johns Hopkins University Baltimore, Md.	Brazil Federal University of Rio de Janeiro Department of Health of Rio de Janeiro Hospital Universitario Clementino Fraga Filho	Tuberculosis control Epidemiology and tropical diseases Infectious diseases Biostatistics
Dr. Robert Gilman Johns Hopkins University Baltimore, Md.	Peru AB PRISMA Universidad Peruana Cayetano Heredia	Cysticercosis Parasitic diseases Epidemiology
Dr. Richard Guerrant University of Virginia Charlottesville, Va.	Brazil Federal University of Ceará	Enteric infections Epidemiology Malnutrition
Dr. Gregory Mertz University of New Mexico Albuquerque, N.M.	Chile Catholic University Ministry of Health University of Chile	Hantaviruses Ecology Epidemiology Molecular virology
Dr. Peter Small Stanford University Stanford, Calif.	Mexico Instituto Nacional de la Nutricion Instituto Nacional de Salud Publica	Tuberculosis Bacterial resistance Molecular epidemiology
Dr. Thomas Strickland University of Maryland Baltimore, Md.	Egypt Ain Shams University American University in Cairo Assiut University Menoufiya University Tropical Medicine Research Institute	Viral hepatitis Epidemiology Molecular genetics

sexual mode of transmission among the nondonors.

The dissertation and postdoctoral research of a Russian AITRP fellow from St. Petersburg State University provided insights into HIV transmission and behaviors associated with increased transmission in St. Petersburg. In a population-based telephone survey of men and women aged 15–55 years, respondents in St. Petersburg said they thought HIV could be spread by kissing (48%), by mosquito bites (56%), and by sharing cigarettes

(29%). More than 13% reported three or more sexual partners in the last year, and 78% reported that they never or seldom used condoms. Although two-thirds of the respondents acknowledged personal risk for infection with HIV, fewer than 25% reported taking any steps to reduce such risk.

In a survey conducted among men who have sex with men, most men indicated that they were bisexual, and 37% reported having female sexual partners in the last 3 months. Risk factors identified with HIV in-

fection included treatment for STDs (37%); selling sexual activity for money (23%); having unprotected anal intercourse in the previous 3 months (38%); and inconsistent condom use (70%). Predictors for high-risk behaviors included poor attitudes about safe-sex practices, weak intentions regarding behavior change, little knowledge about the risk of acquiring AIDS, perceptions that peer norms do not support safe-sex practices, and having a boyfriend. In a further analysis, men who reported having sexual activity

TABLE III-3.**International Malaria Research Training Program, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions		Activity Focus
Dr. Nirbhay Kumar Johns Hopkins University Baltimore, Md.	Zimbabwe	Biomedical Research and Training Institute	Transmission-blocking immunity Vector biology
Dr. Christopher Plowe University of Maryland Baltimore, Md.	Mali	Malaria Research and Training Center	Clinical trials Drug resistance Epidemiology Vector biology
Dr. Philip Rosenthal University of California, San Francisco San Francisco, Calif.	Uganda	Makerere University	Clinical studies Drug resistance Epidemiology Molecular parasitology
Dr. Dyann Wirth Harvard School of Public Health Boston, Mass.	Senegal	Cheikh Anta Diop University	Biology of infected red blood cells HIV and malaria immunity Molecular epidemiology Vector biology
Dr. Guiyun Yan State University of New York Buffalo, New York	Kenya	Kenya Medical Research Institute	Vector biology

with both male and female partners in the last 3 months reported means of 3.3 male and 3.4 female partners. Almost one-half reported engaging in unprotected anal intercourse with their male partners. Although they expressed negative attitudes toward the use of condoms, respondents indicated their intention to increase the use of safe-sex practices and expressed the opinion that peer social norms would support condom use.

These studies highlight some of the similarities between the impending HIV epidemics in China and Russia and long-standing epidemics in other parts of the world. However, the unique cultural, social, political, and economic changes in these countries will require adaptation of known prevention interventions and recognition of the need for new interventions to address the risk of HIV transmission in both general and high-risk populations.

Development of Simple and Reliable Tests for HIV

As research and programs to address the HIV/AIDS epidemic expand in developing countries, the need for simple, valid, and reliable tests for HIV becomes increasingly urgent. AITRP investigators are addressing three areas where improvement in HIV testing is needed: (1) recognition of non-subtype B viruses, (2) easier collection of sam-

ples and use of systems that provide a more stable environment for specimens, and (3) availability of less sophisticated equipment. Assays of viral load are used to monitor disease progression and response to treatment in persons with HIV infection. However, most assays of viral load were developed for subtype B virus, the dominant HIV subtype in the United States. The detection of non-B subtypes dominant in other countries and the performance of current tests for these subtypes are not well documented in populations with dominant non-B epidemics. AITRP investigators at the University of Nairobi, Kenya, trained and supported by the University of Washington, Seattle, evaluated a new test to estimate viral load for non-B HIV. They used specimens of HIV subtypes A, C, and D from Kenya, which are the most common virus types in Kenya, and compared results of the new test with results of a commercially available test designed to detect a broad range of subtypes. The new test was more sensitive to the majority of subtypes, suggesting that it may be a useful measure for quantifying viral load in populations with HIV non-B infections.

If HIV/AIDS prevention and treatment programs are to be successfully expanded, it is necessary to develop unsophisticated tests for use on specimens that can be collected easily and stored for long periods at room

temperature in warm climates. AITRP researchers are working on tests to meet this need. One test uses immunoglobulin E (IgE) rather than IgG for the diagnosis of HIV infection. Unlike IgE, IgG crosses the placenta. Because current enzyme-linked immunosorbent assays rely on IgG, more sophisticated tests such as polymerase chain reaction (PCR) or viral culture are needed to determine the HIV status of newborns. An IgE test evaluated by AITRP researchers from the University of Miami, Florida, resulted in correct diagnosis of HIV infection in 99% of the HIV-infected and noninfected blood tested. This test uses an easier method than the current test to assay a small amount of serum or plasma and does not require use of the complex equipment needed for PCR or viral culture. A PCR assay for HIV, with a simple collection system using filter paper to collect blood, was evaluated by AITRP investigators from Instituto Materno Perinatal and Instituto de Medicina Tropical Alexander von Humboldt, Lima, Peru, and the University of Washington, Seattle. The test had high validity, that is, more than 98% sensitivity and specificity for assay of HIV-positive and HIV-negative specimens from adults and children in the United States and Peru. The sensitivity of the test did not decrease after storage of the specimens for 3 months at room temperature or after incubation at

37°C or 45°C for 20 hours.

Actions for Building Capacity in Support of ICIDR Program

In FY 99, FIC developed the Actions for Building Capacity (ABC) in Support of the International Collaborations in Infectious Disease Research (ICIDR) Program, a research program funded by NIAID. The purpose of ABC is to stimulate high-quality training to support current and future collaborative training-related research on infectious diseases that are predominantly endemic in or that affect people living in tropical countries. ABC provides training opportunities for foreign investigators that will build research capacity and strengthen foreign and U.S. cooperation in research on tropical infectious diseases. ICIDR programs focus on protozoan and helminthic infections, mycobacterial diseases, and bacterial and viral enteric infections, including hepatitis C and E, and fulminant hepatitis of unknown cause. Studies of arboviral infections and other tropical viral infections are specifically encouraged. In FY 99, six awards were made to U.S. universities to include training in medical entomology, vector ecology and behavior, malnutrition, molecular and population genetics of vectors, and bacterial resistance. The Program was recompeted in FY 00 for foreign investigators who did not apply originally, and three additional U.S. universities and four new investigators are now included in the Program (Table III-2).

International Malaria Research Training Program

In FY 00, FIC funded five initial awards to U.S. universities under the new International Malaria Research Training Program (Table III-3). These awards advance collaborative malaria studies between U.S. researchers and colleagues in sub-Saharan Africa and expand the capabilities of scientists and health professionals from developing countries where malaria is endemic to engage in malaria research. This Program provides research training in malaria pathogenesis, epidemiology, vector biology, immunology and vaccines, and clinical practice, as well as development of antimalarial drugs. The Program's objectives support those of the Multilateral Initiative on Malaria, an alliance of organizations and scientists involved in malaria research that was established in 1997, and

they complement the Roll Back Malaria efforts of the World Health Organization (WHO).

International Maternal and Child Health Research and Training Program

FIC established the International Maternal and Child Health Research and Training Program in FY 99 to enable U.S. institutions to support training-related research on issues of maternal and child health that are predominantly endemic in or that affect people who live in developing nations. This Program is designed for the following purposes:

- to increase expertise of scientists in developing countries in biomedical, behavioral, and prevention research related to maternal and child health;
- to support collaborative training in biomedical and behavioral research related to maternal and child health by U.S. and foreign scientists; and
- to establish or strengthen biomedical and behavioral research in maternal and child health and prevention centers of excellence in the home countries of trainees.

In FY 99, awards were made to seven U.S. institutions with foreign collaborations in Bangladesh, Brazil, Cameroon, Chile, China, the Dominican Republic, Ghana, Guatemala, Mexico, Peru, South Africa, Tanzania, and Zambia. In FY 00, this Program was recompeted in collaboration with the Global Network for Women's and Children's Health Research, of the National Institute of Child Health and Human Development (NICHD) (Table III-4).

International Training and Research Program in Emerging Infectious Diseases

In FY 97, in collaboration with NIAID, FIC funded 13 awards to U.S. universities to expand NIH research training efforts in studies of emerging infectious diseases. NIDCR also contributed resources to this Program—the International Training and Research Program in Emerging Infectious Diseases. The long-term objective is to train teams of scientists in regions of the world that provide unique opportunities to understand the fundamental biology, epidemiology, and control of emerging microbial diseases. The Program focuses on research training in the changing patterns of infectious diseases, including genetic evolution, geographic spread, molecular epidemiology; social fac-

tors such as economic development and land use; and control and prevention measures. Funded projects include programs that address emerging and reemerging viruses, parasitic infections, bacterial and rickettsial diseases, and related issues such as microbial resistance to drugs. This Program aims to strengthen the capacity of scientists to understand and respond to disease outbreaks more effectively in the 31 collaborating countries and globally (Table III-5). Selected research highlights for FY 00 are presented here.

The elimination of *Aedes aegypti*, the main vector mosquito of dengue fever, kept South America relatively free of this viral infection for nearly 40 years. In the 1980s, the mosquito reentered the continent and was followed by another potential vector of dengue fever, *Aedes albopictus*. Some 2.5 billion people—two-fifths of the world's population—are now at risk for dengue fever. In an FIC-funded study, researchers from Harvard University, Cambridge, Massachusetts, and Federal University of Ceará, Fortaleza, Brazil, showed correlation between a series of dengue outbreaks in Fortaleza and the density of the vector mosquito. Investigators analyzed data on antidengue activities and estimated the prevalence of dengue cases from information obtained from public records and antivector measures, which included removal of mosquito-breeding containers, treatment of the containers with larvicide, and spraying of a potent insecticide, malathion. The density of mosquito vectors was expressed as an index representing the proportion of inspected houses that contained one or more larval *Aedes aegypti*. Retrospective analysis of antivector activity showed that each outbreak was preceded by relaxation of monitoring and of activity to reduce the number of breeding sites for the vector mosquitoes. Because dengue fever remains suppressed as long as breeding sites are reduced, application of larvicide is the most effective mode of prevention.

Penicillin was once the major weapon against *Streptococcus pneumoniae*, the causative agent of severe pneumonia in children younger than 5 years of age, which is responsible for 1 million deaths each year in this age group. In many parts of the world, including developing countries, where poverty and poor health care contribute to a high incidence of life-threatening

TABLE III-4.**International Maternal and Child Health Research and Training Program, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus
Dr. Michael Bennish Tufts University— New England Medical Center Boston, Mass.	South Africa University of Natal	Low birth weight Growth, nutrition, and early child development Social consequences of HIV/AIDS
Dr. Kenneth Brown University of California, Davis Davis, Calif.	Bangladesh International Center for Diarrheal Disease Research Ghana University of Ghana Guatemala Institute of Nutrition of Central America and Panama Mexico Institute of Public Health Pakistan Aga Khan University Peru Nutrition Research Institute	Nutrition in pregnancy and lactation Infant feeding Micronutrient deficiencies
Dr. Wafaie Fawzi Harvard University Cambridge, Mass.	China Shanghai Second Medical School Tanzania Muhimbili University Public health nutrition	Neonatal host defenses Infectious disease Behavioral sciences Child development
Dr. Sioban Harlow University of Michigan Ann Arbor, Mich.	Mexico El Colegio de Sonora	Reproductive and perinatal epidemiology Preeclampsia Cervical cancer
Dr. Michael Mennuti University of Pennsylvania Philadelphia, Pa.	Chile University of Chile Mexico Instituto Nacional de Perinatología Universidad Nacional Autónoma de México	Preterm labor Tocolysis Premature rupture of fetal membranes Preeclampsia Trophoblast function Intrauterine growth retardation
Dr. Charles Mitchell University of Miami Miami, Fla.	Brazil Universidade de Caxias do Sul Pediatric Dominican Robert Reed Children's Hospital Republic Zambia University of Zambia Teaching Hospital	HIV/AIDS and perinatal transmission Perinatal infections and maternal/infant morbidity and mortality Viral oncology and AIDS-associated malignant conditions
Dr. Diane Taylor Georgetown University Washington, D.C.	Cameroon University of Yaoundé	Malarial immunity in pregnant women, neonates, and children

pneumococcal diseases (e.g., meningitis), resistance to antimicrobial therapies (e.g., penicillin) results in significant mortality. FIC-supported researchers from Oswaldo Cruz Institute, Salvador, Brazil, and at the University of California, Berkeley, and Cornell University, Ithaca, New York, analyzed population-based data on children to assess risk factors for acquiring penicillin-resistant pneumococcal disease. Using an inexpensive and rapid method for typing penicillin-resistant *S. pneumoniae* in investigations of pneumococcal outbreaks, they found that approximately 10% of children had pneumococcal meningitis with an intermediate level of resistance to penicillin. Penicillin-resistant isolates were significantly associated with an age of 2 years and younger, previous antibiotic use, and resistance to another antibiotic. The researchers also

found that a closely related strain (serotype 14) was responsible for more than 50% of the cases of pneumococcal meningitis with resistance to penicillin. The increasing spread of penicillin-resistant strains of meningitis-causing pneumococcus, particularly serotype 14, suggests an urgent need for more effective prevention strategies, including those involving new drug regimens.

An estimated 170 million people worldwide have hepatitis C, a major emerging disease caused by the hepatitis C virus (HCV). Because chronic hepatitis may be associated with specific strains of HCV, development of easy and inexpensive methods of genotypic characterization has become increasingly important, to improve clinical management and public health control, especially in countries where HCV poses an emerging public health problem and where there is a

limited capacity to diagnose infection at the genotypic level. Although several techniques exist for genotyping HCV, most are labor intensive, costly, and confined to research or reference laboratories. FIC-supported scientists from Prague, Czech Republic, and the University of California, Berkeley, described a new and relatively inexpensive method for characterizing HCV: restriction site-specific polymerase chain reaction (RSS-PCR). With this approach, blood samples from patients with hepatitis C were analyzed to predict subtypes. The sensitivity and specificity of the RSS-PCR test for the differentiation of HCV subtype 1b from the other subtypes were 100%. This method can be modified to differentiate any hepatitis C genotype or subtype. The simplicity and speed of the RSS-PCR method may provide new opportunities for more laboratories

TABLE III-5.**International Training and Research Program in Emerging Infectious Diseases, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus
Dr. Robert Gilman Johns Hopkins University Baltimore, Md.	Peru AB PRISMA Hospital Apoya Iquitos Hospital del Niño Hospital Dos de Mayo Neurological Hospital Universidad Peruana Cayetano Heredia	Malaria Tropical medicine Epidemiology Molecular microbiology Parasitic and enteric infections
Dr. Richard Guerrant University of Virginia Charlottesville, Va.	Brazil Federal University of Ceará Universidade Federal do Rio Grande do Norte University of Santa Catarina China Anhui Medical University Ghana Kumasi Medical School University of Ghana Medical School India Jawaharlal Nehru University Mexico National Institute of Reference Diagnostics and Epidemiology Philippines University of Manila	Clinical tropical medicine Geographic and international medicine Enteric infections
Dr. Warren Johnson Cornell University Medical College New York, N.Y.	Brazil Federal University of Bahia Federal University of Rio de Janeiro Oswaldo Cruz Institute Haiti Group Haitian Etude Sarcoma Kaposi Infection Opportunistic Centre (National Institute for Laboratory Research)	Malaria Epidemiology Virology Bacterial and protozoal diseases Microbial resistance to drugs
Dr. James Kazura Case Western Reserve University Cleveland, Ohio	Kenya Institute of Primate Research Kenya Medical Research Institute University of Nairobi Papua New Guinea Institute of Medical Research	Malaria Vector-borne diseases Genetic epidemiology Molecular pathogenesis
Dr. Larry Laughlin Uniformed Services University of the Health Sciences Bethesda, Md.	Belize Ministry of Health Brazil Instituto de Medicina Tropical do Amazonas Peru Instituto Nacional Saludad Ministry of Health, Ancash and Cusco Regions Universidad Peruana Cayetano Heredia Universidad San Marcos	Malaria Molecular epidemiology Tropical medicine Microbiology and immunology
Dr. Myron Levine University of Maryland Baltimore, Md.	Chile Ministry of Health University of Chile Georgia Tbilisi State Medical University Mali National School of Medicine	Malaria Molecular epidemiology Clinical vaccinology Electronic surveillance methods
Dr. Dale Morse New York State Department of Health Albany, N.Y.	Armenia Yerevan State Medical University Czech Republic Charles University National Institute of Public Health Georgia AIDS Clinical Immunology Centre Hungary National Center for Epidemiology St. Lazlo Hospital Kazakhstan Kazakhstan Tuberculosis Center Latvia Clinical Hospital of Infectious Disease Lithuania Republican Immunization Center, Ministry of Health Poland National Institute of Hygiene Russia Russian Academy of Medical Sciences Tuberculosis	Epidemiology Clinical medicine Biomedical and laboratory sciences
Dr. Lee Riley University of California, Berkeley Berkeley, Calif.	Bolivia Universidad Mayor de San Andres Brazil Adolfo Lutz Institute Escola Paulista de Medicina Federal University of Rio de Janeiro Oswaldo Cruz Institute Ecuador Instituto Ecuatoriano de Seguro Social Guatemala Instituto de Nutricion de Centro America y Panama Mexico Universidad Autónoma de Guerrero Nicaragua Centro Nacional de Diagnostico y Referencia Peru Peruvian-American Interchange Society	Hepatitis C Multidrug resistance Drug-resistant infections Bacterial and enteric diseases

TABLE III-5. (Continued)**International Training and Research Program in Emerging Infectious Diseases, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus
Dr. Peter Small Stanford University School of Medicine Stanford, Calif.	Mexico Instituto Nacional de Diagnostico y Referencia Epidemiologica Ministry of Education Universidad Nacional Autónoma de Mexico	Tuberculosis Enteric infections Emerging pathogens
Dr. Andrew Spielman Harvard School of Public Health Boston, Mass.	Brazil Ethiopia São Paulo Federal Medical School Tigray Health Bureau	Malaria Tuberculosis Epidemiology Tropical medicine
Dr. Ken Stuart University of Washington Seattle, Wash.	India Indonesia Kenya Mexico Venezuela Jawaharlal Nehru University Bogor Agricultural University University of Nairobi Universidad Nacional Autónoma de Mexico CINVESTAV-IPN Universidad Central de Venezuela	Malaria Hepatitis C Viral pathogens Molecular biology
Dr. Terrie Taylor Michigan State University East Lansing, Mich.	Malawi South Africa University of Malawi College of Medicine University of Natal Medical School	Malaria Chemical pathology Parasitic biochemistry Entomology Epidemiology
Dr. David Walker University of Texas School of Medicine Galveston, Tex.	Mexico Peru Universidad Autónoma de Yucatán General Epidemiology Office Instituto Nacional de Salud	Rickettsiology Pathology Mammalogy Entomology

around the world to study the epidemiology of HCV infections and the relationship between HCV genotypes and clinical outcome and may be useful for genotyping other pathogens that cannot be easily isolated or cultured.

International Training and Research Program in Environmental and Occupational Health

In FY 95, FIC cooperated with the NIH's National Institute of Environmental Health Sciences (NIEHS) and with the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (CDC), to develop the International Training and Research Program in Environmental and Occupational Health (ITREOH). This Program supports training and research in general environmental health and occupational health for scientists from developing countries and emerging democracies.

The Program helps to increase national capacity to identify and address health risks related to air, water, and land pollution; environmental change and degradation; and dangers to workers. It fosters cooperative research with regions of the world having rel-

atively high contamination levels that present opportunities to study the effects of environmental agents and occupational dangers on human health and to develop new interventions.

In FY 95, seven awards were made to U.S. universities, including schools of medicine and public health. Areas of research and training that are addressed include studies of the biological effects of environmental contaminants; epidemiology of environment- and work-related diseases; and investigation of the relationships between environmental changes and the rise of infectious diseases. Trainees include health scientists, clinicians, epidemiologists, toxicologists, engineers, industrial hygienists, chemists, and allied health workers.

In FY 96, an additional five awards were made with increased support from NIEHS and the National Institute for Occupational Safety and Health and from a new partner—the National Center for Environmental Health, CDC. Projects funded in FY 96 include training and research in occupational medicine; epidemiology and health; environmental toxicology and assessment of exposure to environmental agents; industrial

hygiene; air and water pollution; and biomedical engineering. One additional award was made in September 1997 for studies related to environmental epidemiology, air and water pollution, and risk assessment. The number of collaborating countries in this Program is now 27 (Table III-6).

An external program review committee was formed in FY 00 to evaluate the activities of ITREOH and provide recommendations on the best use of available resources by FIC and its funding partners to advance research and training collaborations between U.S. universities and institutions in developing nations. An RFA taking into consideration the committee's recommendations and other input was developed, and a scientific review of proposals will take place in FY 01. Selected research and program accomplishments during FY 00 are presented here.

Scientists from the University of California, Los Angeles, in collaboration with ITREOH trainees at the National Institute of Public Health, Cuernavaca, Mexico, wrote and edited a textbook on environmental epidemiology for public health graduate students. The book, written in Spanish, covers

TABLE III-6.**International Training and Research Program in Environmental and Occupational Health, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus	
Dr. David Carpenter University at Albany State University of New York Rensselaer, N.Y.	Czech Republic	Masaryk University National Institute of Public Health (Center for Industrial Hygiene)	Air pollution Hazardous waste management Industrial hygiene Environmental and occupational health policy
	Hungary	Balaton Limnological Institute Hungarian Academy of Sciences National Institute of Hygiene	
	Poland	Institute of Occupational Medicine and Environmental Health	
	Romania Ukraine	Institute of Hygiene Bucovinian State Medical Academy	
Dr. Luz Claudio Mt. Sinai School of Medicine New York, N.Y.	Brazil	Federal University of Parana University Hospital of Clementino Fraga Filho	Air pollution Heavy-metal poisoning Pesticide poisoning
	Chile	Chilean Security Association National Institute of Public Health	
Dr. Steven Markowitz Queens College Flushing, N.Y.	Mexico	University of Concepción Medical School National Institute of Public Health	Epidemiology Occupational and environmental medicine Environmental monitoring Application of molecular biology to environmental health
		Pan American Center for Human Ecology and Health Pan American Center for Sanitary Engineering	
Dr. Thomas Cook University of Iowa Iowa City, Iowa	Czech Republic	National Institute of Public Health	Environmental epidemiology Exposure assessment Acute and chronic respiratory diseases Ergonomics Pesticides Agricultural and rural environmental exposures
	Hungary	University Medical School	
	Romania	Institute of Public Health	
	Slovakia	Institute of Preventive and Clinical Medicine	
	Slovenia	Nova Gorica Polytechnic	
Dr. George Delclos Dr. Sarah Felkner University of Texas Houston, Tex.	Colombia	Universidad Pontificia Javeriana	Occupational and environmental epidemiology Environmental science Industrial ergonomics and safety
	Costa Rica	Caja Costarricense de Seguro Social Centro de Educacion y Investigacion en Salud de Seguro Social	
	Mexico	National Autonomous University of Mexico	
	Venezuela	Universidad de Carabobo Centro de Estudios en Salud de los Trabajadores Universidad Central de Venezuela Universidad Centro-Occidental	
Dr. Douglas Dockery Harvard School of Public Health Boston, Mass.	China	Anhui Medical University	Environmental epidemiology Environmental engineering Occupational health
		Beijing Medical University	
		First Hospital of Shanghai Textile Industry	
		Liaong Provincial Public Health and Anti-Epidemic Station	
		Nanjing Medical University	
Dr. John Froines University of California, Los Angeles Los Angeles, Calif.	Mexico	Autonomous University of Baja	Air and water pollution Epidemiology Ergonomics Industrial hygiene Injury prevention Occupational medicine Pollution prevention and toxicology
		Autonomous University of San Luis Potosi	
		CINVESTAV	
		National Autonomous University of Mexico	
		National Institute of Public Health Technical Institute of Monterrey	
Dr. Ian Greaves University of Minnesota Minneapolis, Minn.	Philippines	University of the Philippines College of Public Health	Occupational health Environmental epidemiology Risk assessment and communication Air and water pollution
Dr. Daniel Hryhorczuk University of Illinois Chicago, Ill.	Belarus	Minsk Institute of Radiation Medicine Research Institute of Oncology and Medical Radiology	Epidemiology Exposure assessment
	Lithuania	Vilnius Gediminas Technical University	
	Ukraine	Kiev Research Institute Ministry of Environmental Protection Ministry of Health	

TABLE III-6. Continued

International Training and Research Program in Environmental and Occupational Health, Fiscal Year 2000

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus	
Dr. Matthew Keifer University of Washington Seattle, Wash.	Costa Rica	Universidad Nacional	Clinical medicine Industrial hygiene Toxicology Epidemiology Occupational health nursing
	Ecuador	Corporation para el Desarrollo de la Produccion y el Medio Ambiente Laboral	
	Mexico	National Institute of Public Health	
	Nicaragua	Ministry of Health	
	Thailand	Burapha University	
	Vietnam	Hanoi Medical College	
Dana Loomis University of North Carolina Chapel Hill, N.C.	Brazil	Bahia Institute for Collective Health Federal University of Bahia	Environmental exposure assessment Environmental/occupational epidemiology Occupational health
Dr. Evangelos Petropoulos Michigan State University East Lansing, Mich.	Bulgaria	Bulgarian Academy of Sciences Institute of Inorganic Chemistry Medical University of Sofia National Center of Infectious and Parasitic Diseases National Center of Hygiene, Medical Ecology, and Nutrition	Environmental toxicology Industrial hygiene Occupational health and safety Food safety and toxicology Environmental epidemiology Environmental sociology Environmental engineering
	Romania	National Romanian Academy of Sciences	
Dr. Thomas Robins University of Michigan School of Public Health Ann Arbor, Mich.	Botswana	Ministry of Health	Occupational medicine Industrial hygiene Air and water pollution Toxicology Occupational epidemiology
	Lesotho	Department of Health	
	South Africa	Cape Technikon Natal Technikon National Center for Occupational Health University of Cape Town University of Natal	
	Zimbabwe	National Society Security Authority	
Dr. Kirk Smith University of California Berkeley, Calif.	China	Institute of Environmental Health and Engineering Institute of Occupational Medicine	Environmental health Epidemiology Air pollution Toxicology
	India	University of Madras	

topics drawn from Latin American experience, including (a) the relationship between the prevalence of bladder cancer and arsenic exposure in Argentina; (b) urban exposure to mercury in gold production areas of Brazil; (c) the association between birth defects and exposure to pesticides in Colombia; and (d) the relationship between chronic respiratory illness and exposure to wood smoke in women in Mexico.

ITREOH trainees and their colleagues at the FIC-funded University of Illinois Data Management Center, Kyiv, Ukraine, assisted in processing a large backlog of data. They were able to establish systems to prospectively manage data from a binational cohort study of the relationship between the radiation released in the 1986 nuclear power plant accident at Chernobyl, Ukraine, and the prevalence of thyroid cancer in children. The U.S. Department of Energy is funding a study by NCI and the Ukrainian Institute of Endocrinology and Metabolism, Kyiv. The

U.S. and Ukrainian research partners have requested establishment of a data-management center at the Ukrainian Institute of Endocrinology and Metabolism to continue support of this binational project and to build the research capacity of the Ukrainian scientists. This data-management center, supported by ITREOH, is an example of a scientific center of excellence that is facilitating high-quality research in Ukraine.

International Training and Research Program in Population and Health

In FY 95, in cooperation with NICHD, FIC developed the International Training and Research Program in Population and Health, to support training and research programs in population-related sciences for scientists and health professionals from developing countries. The Program enhances domestic programs in population research by enabling NIH grant recipients in the United States to extend the geographic base of their work

internationally. The National Institute on Aging joined the Program in January 1999.

In FY 00, recompeting renewal grants were awarded to the original seven U.S. universities and two new U.S. institutions. Schools of medicine and public health at the U.S. institutions collaborate with institutions abroad in training and research activities in population-related sciences. The grants include research partnerships in 31 countries (Table III-7). Funded projects cover training of scientists who are foreign nationals and research to enhance international and U.S. population studies. Areas of international collaboration in population research include examination of various aspects of reproductive processes (e.g., biology, immunology, and genetics), development of contraceptive agents, evaluation of contraceptive and reproductive health, and reproductive epidemiology. The Program also supports study of demographic processes, including aging, longevity, biodemography, mortality, mor-

TABLE III-7.**International Training and Research Program in Population and Health, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus
Dr. P. Michael Conn Oregon Health Sciences University Beaverton, Ore.	Chile Universidad de Chile Universidad de Concepción Instituto de Histología y Patología Mexico Hospital ABC Hospital General de Mexico Hospital Juarez Instituto Mexicano de Seguro Social Universidad Nacional Autónoma de Mexico	Reproductive biology Neuroendocrinology and nonhuman primates
Dr. Frank French University of North Carolina Chapel Hill, N.C.	Brazil Escola Paulista de Medicina Chile Instituto Chileno de Medicina Reproductiva China Shanghai Institute of Biochemistry Shanghai Institute of Planned Parenthood Research India All India Institute of Medical Sciences National Institute of Immunology Kenya Institute of Primate Research	Reproductive biology Fertilization and implantation Reproductive neuroendocrinology Regulation of sperm maturation
Dr. Ron Gray Johns Hopkins University Baltimore, Md.	Uganda Makerere University	HIV transmission and contraceptive use
Dr. John Herr University of Virginia Charlottesville, Va.	China Peking Union Medical College India Calcutta University Hindu University Indian Institute of Chemical Biology Indian Institute of Science Institute for Reproduction Research National Institute of Immunology Punjab University	Reproductive biology Development of contraceptive vaccine Vaccine immunogens Recombinant/synthetic proteins and peptides
Dr. David Lam University of Michigan Ann Arbor, Mich.	Brazil University of Minas Gerais, Center for Development and Regional Planning China China Population Information and Research Center Capital University of Economics and Business Tibet University Nepal Kathmandu University Tribhuvan University South Africa University of Cape Town Thailand Chulalongkorn University National Statistical Office Vietnam Institute of Sociology	Social and cultural determinants of fertility Demography Family planning
Dr. Alberto Palloni University of Wisconsin Madison, Wis.	Brazil University of Minas Gerais, Center for Development and Regional Planning Costa Rica Universidad de Costa Rica Mexico Colegio de Mexico	Health in populations under stress Well-being of older adults Family health Maternal and child health
Dr. Barry Popkin University of North Carolina Chapel Hill, N.C.	China Chinese Academy of Preventive Medicine Ecuador Centro de Estudios de Poblacion y Desarrollo Social Fundacion EcoCiencia Philippines University of San Carlos Russia Russian Academy of Medical Sciences Russian Academy of Science Russian Institute of Nutrition Thailand Mahidol University	Health nutrition Conception Reproduction
Dr. Jerome Strauss University of Pennsylvania Philadelphia, Pa.	Argentina Instituto de Biología y Medicina Experimental Universidad Nacional de Cuyo-Consejo Nacional de Investigaciones Científicas y Técnicas Brazil State University of Campinas Chile University of Chile Pontificia Universidad de Chile Mexico Instituto Mexicano de Seguro Social Instituto Nacional de Perinatología Instituto Nacional de la Nutrición Universidad Nacional Autónoma de Mexico Uruguay Universidad de la Republica Facultad de Medicina	Reproductive biology Molecular endocrinology Gametogenesis and fertilization Embryo development and implantation

TABLE III-7. Continued

International Training and Research Program in Population and Health, Fiscal Year 2000

Principal Investigator/ U.S. Institution	Collaborating Countries/Institutions	Activity Focus	
Dr. Tukufu Zuberi University of Pennsylvania Philadelphia, Pa.	Argentina	National Center for Population Research	Social and behavioral migration Fertility and economic status Fertility and mortality
	Bolivia	National Children's Welfare Program World Bank, La Paz	
	Cameroon	Institut Formation et de Recherche Démographiques	
	Costa Rica	University of Costa Rica	
	Côte D'Ivoire	African Development Bank	
	Dominican Republic	Institute for Social Sciences	
	Ethiopia	Central Statistical Authority United Nations Population Fund	
	The Gambia	Central Statistics Office	
	Ghana	United Nations Regional Institute for Population Studies Navrongo Health Research Center	
	Kenya	Africa Population Policy Research Center University of Nairobi	
	Malawi	University of Malawi	
	Mexico	Center for Population Studies Inter-American Development Bank Programa de Educación, Salud y Alimentación University of Guadalajara	
	Namibia	University of Namibia	
	Senegal	Direction de la Prévision et Statistique	
	South Africa	University of Nairobi University of Transkei	
	Uganda	Institute for Statistics and Applied Economics	
	Zimbabwe	Central Statistical Office University of Zimbabwe	

bidity, fertility, migration, linkages between health and economic development, and other social, behavioral, and economic factors that influence population dynamics. This training will strengthen the ability of scientists from developing nations to contribute to global population research efforts and to advance knowledge in support of population policies appropriate for their home countries and established international guidelines. Accomplishments in FY 00 are presented here.

Researchers at the University of Pennsylvania, Philadelphia, have been working with the census bureaus of 20 African countries in the African Census Analysis Project to develop methods and tools that will facilitate access to census data for demographic and statistical analysis. Census data have been collected routinely in many countries but have not been used to full advantage in demographic analysis. Population and health trainees, working with investigators from the African Census Analysis Project, have used the census data from their countries to explore such issues as provincial differences in mortality in children younger than 5 years of age in Kenya, national and region-

al ethnic diversity in Senegal, and patterns of fertility and marriage among the many population groups in South Africa.

To facilitate the exchange of information among scientists in the United States and Mexico, scientists from the Oregon Health and Science University, Portland, developed a program using current information technology, in which seminars and discussions in journal clubs in both countries were broadcast in real time. This approach allowed the scientists working in reproductive biology at both sites to fully participate in the discussion with their colleagues at the other site.

The effect of declining fertility on the traditional and social structure for support of parents who are older adults is of interest to researchers at the University of Michigan, Ann Arbor, and their FIC-supported trainees at the Institute of Sociology, Hanoi, Vietnam. A recent analysis of data collected in two surveys in northern and southern Vietnam showed that, although the older adults were heavily dependent on their children for support, the effects of having fewer children did not seem to reduce the support received by the parents. However, the find-

ings indicated that parents in one group of older adults in northern Vietnam who had no sons were potentially vulnerable to lower levels of support.

Male contraception remains an important research focus for investigators and trainees from Asia and Latin America at the University of Virginia, Charlottesville, and the University of Pennsylvania, Philadelphia. In particular, understanding the biology, physiology, immunology, and genetics of sperm will be crucial in identifying specific sperm targets for male contraceptive vaccines.

International Training in Medical Informatics

In FY 98, in collaboration with NIAID and the National Library of Medicine (NIH), FIC developed the International Training in Medical Informatics (ITMI) Program to address the gap between developed and developing countries in the area of modern information technologies. The Program is designed to assist scientists in developing countries and their U.S. collaborators in efforts to meet local and global health needs through improved access to scientific and clinical information on health threats and

TABLE III-8.**International Training in Medical Informatics Program, Fiscal Year 2000**

Program Director	U.S. Institution	Collaborating Countries
Dr. Michael Bennish	New England Medical Center Hospitals Boston, Mass.	South Africa Zambia
Dr. Timothy De Ver Dye	University of Rochester Rochester, N.Y.	Costa Rica
Dr. Taha El Tahir Taha	Johns Hopkins University Baltimore, Md.	Malawi
Dr. Cynthia Gadd	University of Pittsburgh Pittsburgh, Pa.	Nigeria
Dr. Ann Marie Kimball	University of Washington Seattle, Wash.	Peru
Dr. Frances Mather	Tulane School of Public Health and Tropical Medicine New Orleans, La.	Mali
Dr. Daniel McGee	Medical University of South Carolina Charleston, S.C.	Jamaica Nigeria
Dr. Charles Mitchell	University of Miami School of Medicine Miami, Fla.	Zambia
Dr. Lucila Ohno-Machado	Brigham and Women's Hospital Boston, Mass.	Brazil
Dr. William Tierney	Regenstrief Institute Indianapolis, Ind.	Kenya

TABLE III-9.**Minority International Research Training Grants, Fiscal Year 2000**

Principal Investigator	U.S. Institution	Collaborating Countries/Institutions
Dr. Winston Anderson	Howard University Washington, D.C.	Cameroon, Ethiopia, Ghana, Italy, Mali, Switzerland
Ms. Earnestine Baker	University of Maryland, Baltimore, Md.	England
Dr. Malinda Fitzgerald	Christian Brothers University Memphis, Tenn.	Brazil
Dr. John Karen Frei	Barry University Miami, Fla.	England, Italy, Jamaica, Korea
Dr. Fannie Gaston-Johansson	Johns Hopkins University Baltimore, Md.	Israel, South Africa, Sweden
Dr. Robert Glew	University of New Mexico Albuquerque, N.M.	Nigeria
Dr. George Hillyer	University of Puerto Rico San Juan, P.R.	Australia, England, Germany, Scotland, Spain
Dr. Pauline Jolly	University of Alabama Birmingham, Ala.	Bangladesh, Ghana, Guatemala, Guyana, Jamaica, Trinidad and Tobago
Dr. Gary King	Pennsylvania State University University Park, Pa.	France, Senegal, South Africa
Dr. Betsy Lozoff Ann Arbor, Mich.	University of Michigan South Africa	Chile, China, Costa Rica, India,
Dr. Beverly McElmurry	University of Illinois Chicago, Ill.	Botswana, Brazil, Chile, Colombia, Malawi, South Africa, Swaziland

through improved research and surveillance capabilities.

The goals of the Program are threefold:

1. to improve the informatics capacity of institutions in developing countries, to advance research and health surveillance activities by providing informatics training for local researchers in the context of a high-quality, international, biomedical research endeavor;

2. to provide targeted, short-term training in informatics and related disciplines at U.S. institutions and in the home country, to develop and disseminate locally adapted knowledge of informatics technologies; and

3. to expand and improve ongoing collaborative research between scientists in the United States and developing countries in the prevention, control, and treatment of diseases relevant to public health in the home country.

The first competition of this Program focused on training scientists from sub-Saharan Africa. Four 4-year awards were made in FY 98 for training in Kenya, Malawi, South Africa, and Zambia. The second competition, in FY 99, added projects in Africa and Latin America, expanding the program with six additional awards, to include projects in Brazil, Costa Rica, Jamaica, Mali, Nigeria, and Peru (Table III-8). Examples of training supported by the ITMI Program are presented here.

The lack of systems for accurate record keeping for medical information on patients in rural Africa is a critical issue because, without such systems, there are no reliable means to estimate the prevalence of infectious diseases across populations, to prescribe therapies consistently, to track outpatient visits, or to manage diseases such as AIDS in any country. FIC-supported trainees in Kenya, working with colleagues at Indiana University, Bloomington, and the Moi University Faculty of Health Sciences, Eldoret, Kenya, developed an electronic system for keeping medical records on outpatients at Mosoriot Health Center, Eldoret. This system links health center data with public health research programs of Moi University. The new system provides technology that is critical for improving the public health infrastructure and for enhancing the capacity for epidemiologic research. It optimizes the relatively rudimentary infrastructure of the host institution and information

TABLE III-9. Continued

Minority International Research Training Grants, Fiscal Year 2000

Principal Investigator	U.S. Institution	Collaborating Countries/Institutions
Dr. Susan Opava	California Polytechnic State University San Luis Obispo, Calif.	Czech Republic, Peru, Spain
Dr. Charles Leo Ortiz	University of California Santa Cruz, Calif.	Argentina, Mexico
Dr. Evangelos Petropoulos	Michigan State University East Lansing, Mich.	Brazil, Bulgaria, Jamaica, Mexico, Philippines, Spain, Thailand
Dr. Robert Pozos	San Diego State University San Diego, Calif.	Canada, Germany, Italy, Mexico, Uganda
Dr. Bettaiya Rajanna	Alcorn State University Alcorn State, Miss.	India
Dr. Eloy Rodriguez	Cornell University Ithaca, N.Y.	Brazil, Dominica, Dominican Republic
Dr. Raymond Sis	Texas A&M University College Station, Tex.	Dominican Republic, Mexico
Dr. George Stefano	College at Old Westbury State University of New York Old Westbury, N.Y.	China, France, Italy
Dr. Kim Tan	Winston-Salem State University Winston-Salem, N.C.	Finland, Singapore
Dr. Barbara Timmermann	University of Arizona Tucson, Ariz.	Argentina, Australia, Brazil, Canada, Chile, Costa Rica, Czech Republic, England, France, Germany, Italy, Japan Mexico, the Netherlands, Scotland, South Africa, Spain, Sweden
Dr. Eugene Tull	University of Pittsburgh Pittsburgh, Pa.	Barbados, Dominica, Trinidad and Tobago, Zimbabwe
Dr. Isai Urasa	Hampton University Hampton, Va.	Kenya, Tanzania
Dr. Luis Villarreal	University of California, Irvine Irvine, Calif.	Mexico, Spain
Dr. Jordan Warnick	University of Maryland Baltimore, Md.	Brazil, West Indies
Dr. Bruce Weber	California State University Fullerton, Calif.	Argentina, England, Mexico, Thailand
Dr. Michelle Williams	University of Washington Seattle, Wash.	Ecuador, Peru, South Africa, Zimbabwe
Dr. Saul Winegrad	University of Pennsylvania Philadelphia, Pa.	Belgium, France, Ghana, Japan, Scotland

technology skills of its staff and is likely to be broadly transferable to other medical care facilities in Africa.

Although the need for expertise in medical informatics in sub-Saharan Africa is great, no formal training program is available on the African continent. To meet this need, the ITMI Program at the University of Natal, Durban, South Africa, in collaboration with Tufts University-New England Medical Center, Boston, Massachusetts, has

made significant progress toward the establishment of a master's degree program in medical informatics at the University of Natal, Durban. Local faculty with expertise in informatics will be supplemented by adjunct faculty from Harvard Medical School and Massachusetts Institute of Technology, Cambridge, and Tufts University and New England Medical Center, Boston. Such a program should provide a more efficient and cost-effective means of training a greater

number of students to an advanced level in medical informatics than the only current option of sending students overseas for advanced training. The first students will be enrolled in January 2002.

Minority International Research Training Program

In cooperation with the NIH Office of Research on Minority Health, FIC established the Minority International Research Training (MIRT) Program in FY 93 to provide international educational and research training opportunities to minorities underrepresented in the scientific professions. Training grants are provided to U.S. colleges and universities to stimulate students to pursue biomedical research careers through international experiences.

The MIRT Program is intended to cultivate qualities of leadership by broadening intellectual and cultural horizons. An additional objective is to help ensure that the full diversity of the U.S. student population is represented abroad by young diplomats of science. The MIRT Program incorporates consortium awards that include partnerships between minority and majority institutions. Long-term objectives of these consortia are to increase cooperation between minority and majority institutions and to strengthen an important educational pipeline by exposing students to major research universities.

In FY 00, 28 MIRT programs at colleges and universities throughout the United States sent students abroad for training (Table III-9). An additional 84 colleges and universities participated as members of consortia. Of the total number of MIRT trainees, 39% were recruited from institutions with no MIRT awards and 23% were recruited from minority institutions; 6% of the minority institutions served Hispanics and 18% were historically black colleges and universities. Since 1994, 249 former MIRT trainees have entered master's degree programs, 227 have entered Ph.D. programs, and 262 have entered medical schools or other schools for training in the health professions. Minority students who are not associated with grantee institutions or consortia may apply to participate in a particular international research program. In FY 00, 236 minority students were trained in MIRT programs.

TABLE III-10.**Tuberculosis International Training and Research Program, Fiscal Year 2000**

Program Director/Institution	Major Collaborating Countries
Dr. Salim Abdool Karim Columbia University New York, N.Y.	South Africa
Dr. Christopher Beyrer Johns Hopkins University Baltimore, Md.	Brazil, Haiti, India, Peru, South Africa
Dr. Warren D. Johnson, Jr. Cornell University Medical College New York, N.Y.	Brazil, Haiti, Peru
Dr. Dale Morse Wadsworth Center David Axelrod Institute New York State Department of Health Albany, N.Y.	Czech Republic, Georgia, Hungary, Poland, Russia
Dr. Lee Riley University of California School of Public Health Berkeley, Calif.	El Salvador, Guatemala, Mexico
Dr. Gail Shor-Posner University of Miami School of Medicine Miami, Fla.	Dominican Republic, Honduras
Dr. Christopher Whalen Case Western Reserve University Cleveland, Ohio	Mexico, Uganda

Tuberculosis International Training and Research Program

In FY 98, FIC provided funding for competing supplemental awards under the Tuberculosis International Training and Research Program, a collaborative program with the U.S. Agency for International Development. In the first review cycle, seven awards were made to U.S. universities and institutions as supplements to existing grants under AITRP or the International Training and Research Program in Emerging Infectious Diseases (Table III-10), to extend existing research investments in these areas. The supplements aim to build health research efforts and public health capacity globally to better respond to the threat posed by tuberculosis in general and multidrug-resistant tuberculosis in particular. Long-term objectives include the following:

- strengthening laboratory infrastructure to support future tuberculosis surveillance and research;
- building public health capacity for surveillance and clinical trials of promising new interventions and therapies for tuberculosis; and
- enhancing the capability of developing countries to manage programs and conduct

operational research related to prevention and control of the disease.

These awards are designed (1) to prepare current and future generations of researchers and public health workers around the world to confront the global tuberculosis epidemic and (2) to establish and maintain centers for clinical research in and treatment and prevention of tuberculosis, all of which will play a major role in the fight against the reemergence and continuing spread of this disease. Some research advances resulting from this Program are presented here.

Scientists at Cornell University Medical College, New York, New York, and their colleagues at the NIH-supported Cornell University GHESKIO unit in Port-au-Prince, Haiti, conducted a clinical trial in Port-au-Prince to determine (1) whether recurrent tuberculosis after curative tuberculosis treatment is more common in persons who are infected with human immunodeficiency virus type 1 (HIV-1) than in those who are not infected with this virus and (2) whether post-treatment prophylaxis with isoniazid decreases the risk of recurrent tuberculosis. The risk of recurrence was reduced in HIV-1-positive persons, indicating that such prophylaxis should be considered for those with

a history of HIV-1-related symptoms at the time tuberculosis is diagnosed.

Treatment of latent infection is needed to protect HIV-infected persons against tuberculosis, and previous studies have addressed the short-term efficacy of three regimens in HIV-infected adults. A study in Uganda, conducted by scientists from Case Western Reserve University, Cleveland, Ohio, and at Makerere University, Kampala, examined long-term strategies to prevent tuberculosis in HIV-infected persons who have latent tuberculosis infection. Six months of treatment with isoniazid provided short-term protection against tuberculosis in HIV-infected adults who were positive for purified protein derivative, and 3-month regimens including isoniazid plus rifampicin or isoniazid, rifampicin, and pyrazinamide provided protection for up to 3 years. These results are significant because tuberculosis is the major cause of death in HIV-infected persons in the developing world.

International Research Grants Ecology of Infectious Diseases Program

The Ecology of Infectious Diseases initiative of the NIH and the National Science Foundation supports efforts to understand the underlying ecological and biological mechanisms that govern relationships between human-induced environmental changes and the emergence and transmission of infectious diseases. The highly interdisciplinary research projects study how large-scale environmental events (e.g., habitat destruction, biological invasions, and pollution) alter the risks of emergence of viral, parasitic, and bacterial diseases in humans and other animals. The initiative is a team effort to meet a critical need by bridging traditional gaps among scientific disciplines, including population biology, veterinary medicine, geospatial studies, climatology, parasitology, entomology, immunology, and epidemiology.

In FY 00, initial awards were made to fund 12 research projects under the new Ecology of Infectious Diseases initiative (Table III-11). Investigators will work in the United States and six other countries (Belize, China, Kenya, Peru, the Philippines, and South Africa) and will also collaborate with investigators from Denmark, England, France, Ireland, Israel, and Japan.

The grants are funded jointly by the Na-

TABLE III-11.**Ecology of Infectious Diseases, Fiscal Year 2000****JOHN E. FOGARTY INTERNATIONAL CENTER FOR ADVANCED STUDY IN THE HEALTH SCIENCES AWARDS**

Principal Investigator	Institution	Project Title	Collaborating Institutions
Dr. Philip Craig	University of Salford Salford, England	Parasitic Zoonosis (Echinococcosis) Transmission in China	Centers for Disease Control and Prevention Atlanta, Ga. Sichuan Institute of Parasitic Diseases Chengdu, China Lanzhou Medical College Lanzhou, China Xinjiang Medical University Urumqi, China East China Normal University Shanghai, China Université de Franche-Comte Besançon, France University College Dublin, Ireland Asahikawa University Asahikawa, Japan
Dr. Charles King	Case Western Reserve University Cleveland, Ohio	Human Population Growth Impact on <i>Schistosoma haematobium</i>	University of Illinois Urbana, Ill. Hebrew University of Jerusalem Jerusalem, Israel Ministry of Health Nairobi, Kenya
Dr. Stephen McGarvey	Brown University Providence, R.I.	Ecology and Transmission of <i>Schistosoma japonicum</i> : Philippines	Research Institute for Tropical Medicine Manila, Philippines Danish Center for Experimental Parasitology Copenhagen, Denmark University of Oxford Oxford, England

NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES AWARDS

Principal Investigator	Institution	Project Title	Collaborating Institutions
Dr. Eliska Rejmankova	University of California, Davis Davis, Calif.	Environmental Determinants of Malaria in Belize	Uniformed Services University of Health Sciences Bethesda, Md. GeoEcoArc Research Washington, D.C. Ministry of Health Belize City, Belize
Dr. Thomas Unnasch	University of Alabama Birmingham, Ala.	Ecology of Encephalitis Virus in the Southeastern United States	Auburn University Auburn, Ala. Tennessee Valley Authority Knoxville, Tenn.
Dr. Scott Weaver	University of Texas Medical Branch Galveston, Tex.	Effect of Neotropical Deforestation on Arbovirus Ecology	U.S. Department of Agriculture Fort Collins, Colo. Walter Reed Biosystematics Unit/ Smithsonian Institution Washington, D.C. University of Florida Vero Beach, Fla. Texas Tech University Lubbock, Tex. U.S. Naval Medical Research Center Detachment Iquitos, Peru Lima, Peru San Marcos University Lima, Peru

Continued on next page

TABLE III-11. Continued

Ecology of Infectious Diseases, Fiscal Year 2000

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES AWARDS

Principal Investigator	Institution	Project Title	Collaborating Institutions
Dr. Joseph Kiesecker	Pennsylvania State University University Park, Pa.	Wetland Urbanization Gradients and Vector-Borne Diseases	Yale University New Haven, Conn. Wake Forest University Winston-Salem, N.C.

NATIONAL SCIENCE FOUNDATION AWARDS

Principal Investigator	Institution	Project Title	Collaborating Institutions
Dr. David Anderson	Colorado State University Fort Collins, Colo.	Ecology of Virus Transmission in Commensal Bat Colonies	U.S. Geological Survey Fort Collins, Colo. Centers for Disease Control and Prevention Atlanta, Ga.
Dr. Andre Dhondt	Cornell University Ithaca, N.Y.	Dynamics of an Introduced Pathogen	North Carolina State University Raleigh, N.C. Princeton University Princeton, N.J. University of Wisconsin Madison, Wis.
Dr. Wayne Getz	University of California, Berkeley Berkeley, Calif.	Metapopulation Models and Control of Tuberculosis in African Buffalo	San Francisco Department of Public Health San Francisco, Calif. Onderstepoort Veterinary Institute Onderstepoort, South Africa Kruger National Park Skukuza, South Africa
Dr. N. Thompson Hobbs	Colorado State University Fort Collins, Colo.	Spatial and Temporal Dynamics of Prion Diseases in Wildlife: Responses to Changing Land Use	U.S. Geological Survey Fort Collins, Colo. Colorado Division of Wildlife Fort Collins, Colo. University of Wyoming Laramie, Wyo.
Dr. Linda Lowenstine	University of California, Davis Davis, Calif.	Ecology of Herpesvirus Infection and Cancer in Sea Lions	The Marine Mammal Center Sausalito, Calif. Princeton University Princeton, N.J. National Marine Fisheries Service National Oceanic and Atmospheric Administration Seattle, Wash.

tional Science Foundation and the NIH's FIC, NIAID, and NIEHS. These four organizations have together committed more than \$23 million to fund the projects over 5 years. Other Federal agencies participating in the program are the National Aeronautics and Space Administration, the U.S. Department of Agriculture (USDA), and the U.S. Geological Survey. A second RFA for the Ecology of Infectious Diseases initiative will be issued in FY 01.

Fogarty International Research Collaboration Award

To foster research partnerships between U.S.

scientists and their colleagues in regions of the world that provide new scientific opportunities, FIC established the Fogarty International Research Collaboration Award (FIRCA) in FY 92. These small research grants were designed to support collaborative ties with Latin America and the Caribbean, as well as Central and Eastern Europe, including Russia and the Newly Independent States of the Former Soviet Union (NIS). In FY 94, regional eligibility was expanded to include the countries of Africa; Asia (except Japan, Singapore, South Korea, and Taiwan); the Middle East; and the Pacific islands (except Australia and New Zealand). In FY 00, there

were 126 active projects: 79 noncompetitive continuing awards and 47 new awards, including 4 competitive continuing awards (Table III-12).

Through the FIRCA program, funds are provided to purchase supplies, materials, and small equipment for the foreign collaborator's laboratory and to provide travel support for cooperative international studies (up to 25% of the grant award). These grants of \$32,000 per year for up to 3 years are awarded competitively. A stipend of \$5,000 is allowed for the foreign researcher. U.S. participants must be the principal investigators of an ongoing NIH research project

(Au: Please confirm 5 for Czech Republic.)

TABLE III-12.

Fogarty International Research Collaboration Awards by Country, FY 2000

Country	No.
Russia	27
Argentina	15
Brazil	9
Poland	9
China	5
Czech Republic	5
Israel	5
Mexico	5
United Kingdom	5
Hungary	4
India	4
Slovakia	4
Chile	3
Croatia	3
Kenya	3
Slovenia	3
South Africa	2
Uruguay	2
Bolivia	1
Colombia	1
Estonia	1
Fiji	1
France	1
Germany	1
Italy	1
Jamaica	1
Peru	1
Philippines	1
Senegal	1
Switzerland	1
Turkey	1
TOTAL	126

grant during at least the first year of the award period.

FIRCA supports a broad range of international cooperative research in areas such as neuroscience, immunology, emerging and reemerging infectious diseases, pharmacological therapeutics, genetics, and women's health issues. Examples of FIRCA projects undertaken in FY 00 are presented here.

Investigators from the University of Washington, Seattle, Tel Aviv University, Israel, and Bethlehem University are collaborating on mapping and cloning the genes responsible for different types of inherited deafness (progressive and early-onset) in families from Israel and the Palestinian Authority, where incidence of preverbal deafness is among the highest in the world. In the past 1½ years, they have identified a gene for deafness and have found critical mutations in the deafness gene, connexin 26. Hearing

loss has an enormous personal and economic impact around the world. Understanding the function of genes in the inner ear will lead toward a new generation of treatments of audiovestibular disorders. Genetic studies such as these may someday enable more effective treatment of both inherited and environmentally caused hearing loss.

Scientists at Yeshiva University, New York, New York, and Ben Gurion University of the Negev, Israel, are examining the effects of taxol on signaling pathways in ovarian cells. Taxol, a natural product, has significant antitumor activity in a large number of human tumors. In addition to stabilizing microtubules and blocking cell-cycle progress, taxol can alter gene expression by interacting with the signal transduction pathway of mitogen-activated protein (MAP) kinase. Previous work in this study demonstrated that tyrosine phosphorylation of an adaptor protein, She, and formation of She/grb2/SOS complexes occurred when cells from a cell line of murine macrophages were treated with taxol. The investigators are extending these observations to examine human ovarian carcinoma cells. The aims of this research are as follows:

1. to study the effect of taxol on activation of the MAP kinase pathway in human ovarian carcinoma cell lines;
2. to compare the effect of taxol with the effects of taxotere and other taxol analogues on the activation of the *ras*/MAP kinase signaling pathway and to determine the effects of this activity on microtubule stabilization and cytotoxicity; and
3. to compare the effects of taxol and taxotere in the MAP kinase signaling pathway in taxol-sensitive and taxol-resistant human ovarian carcinoma cells.

HIV/AIDS and Related Illnesses Fogarty International Research Collaboration Award

In addition to FIRCAs, small collaborative grants are available to U.S. principal investigators who have NIH grants for international collaborative projects related to HIV/AIDS. The HIV/AIDS and Related Illnesses Fogarty International Research Collaboration Award (AIDS-FIRCA) provides up to \$32,000 per year for a maximum of 3 years. Regional eligibility is not limited. In FY 00, FIC awarded 27 AIDS-FIRCAs: 18 non-

TABLE III-13.

HIV/AIDS and Related Illnesses Fogarty International Research Collaboration Awards by Country, Fiscal Year 2000

Countries	No.
Hungary	3
Cameroon	2
Croatia	2
Italy	2
Mexico	2
Russia	2
South Africa	2
Zimbabwe	2
Belize	1
Brazil	1
Canada	1
Colombia	1
India	1
Israel	1
Malawi	1
Panama	1
Thailand	1
United Kingdom	1
TOTAL	27

competitive continuations and 9 continuing awards, including 1 competitive continuation (Table III-13). Examples of research funded in FY 00 under the AIDS-FIRCA program are presented here.

Researchers at Yeshiva University, New York, and the University of Perugia, Italy, are exploring development of antibodies to protect against cryptococcal infections. *Cryptococcus neoformans* infections are usually incurable in patients with AIDS, and there is a major need for new therapies. The researchers are attempting to identify the most effective human IgG subclass for use in promoting phagocytosis and killing of *C. neoformans* by human monocytes and neutrophils from patients with or without HIV infection. They are also working to identify the human IgG subclass that is most effective in promoting proinflammatory cytokine expression, T-cell activation, and expression of costimulatory molecules in human leukocytes exposed to *C. neoformans*. The U.S. laboratory is purifying chimeric antibodies, and the Italian laboratory is testing their efficacy with human cells.

Investigators at Mt. Sinai School of Medicine, City University of New York, New York, and the Medical Research Council, Tygerberg, South Africa, are studying the factors that contribute to HIV risk behav-

TABLE III-14.**International Cooperative Biodiversity Groups, Fiscal Year 2000**

Principal Investigator/ U.S. Institution	Host Countries	Foreign Collaborating Investigators/Institutions	Domestic Collaborating Investigators/Institutions
Dr. Brent Berlin University of Georgia Athens, Ga.	Mexico	Dr. Mario Gonzalez El Colegio de la Frontera Sur San Cristóbal de las Casas Chiapas Dr. Robert Nash Molecular Nature, Ltd. Wales	Dr. Eloise Ann Berlin Dr. David Puett University of Georgia
Dr. Phyllis Coley Smithsonian Tropical Research Institute Panama City, Panama	Panama	Dr. Mahabir Gupta University of Panama Panama City Dr. Eduardo Ortega-Barria Florida State University Panama City	Dr. Todd Capson Dr. Don Windsor STRI Dr. Kenneth Bair Novartis Dr. Tom Kursar University of Utah
Dr. David Kingston Virginia Polytechnic Institute and State University Blacksburg, Va.	Madagascar Suriname	Dr. Rabodo Andriantsiferana Center for Natural Products Research Antananarivo Mr. Stan Malone Conservation International Suriname Paramaribo Dr. Jan Wisse Bedrijf Geneesmiddelen Voorzienig Paramaribo	Dr. Salvatore Forenza Bristol-Myers Squibb Pharmaceutical Research Institute Dr. B. Cliff Gerwick Dow Elanco Agrosiences Dr. James Miller Missouri Botanical Garden Dr. Russell Mittermeier Conservation International
Dr. Brian Schuster Walter Reed Army Institute of Research Washington, D.C.	Cameroon Nigeria	Dr. Simon Mbua Efange University of Buea Buea Dr. Paul Iwe Akubue University of Nigeria/INTERCEDD Nsukka Dr. Maurice Iwu Bioresources Development and Conservation Washington, D.C./Nsukka, Nigeria	Dr. Francisco Dallmeier Dr. Elizabeth Losos Smithsonian Institution Dr. Joan Jackson Dr. Wilbur Milhous Walter Reed Army Institute of Research
Dr. Djaja Soejarto University of Illinois Chicago, Ill.	Laos Vietnam	Dr. Boun Hoong Southavong Research Institute for Medicinal Plants Vientiane Dr. Li Thi Xuan National Center for Natural Sciences and Technology Hanoi Dr. Melanie O'Neill Glaxo Wellcome United Kingdom	Dr. John Pezzuto University of Illinois, Chicago Dr. Harry Fong University of Illinois, Chicago
Dr. Barbara Timmermann University of Arizona Tucson, Ariz.	Argentina Chile Mexico	Dr. Enrique Suarez National Institute for Agricultural Technology Buenos Aires Professor Gloria Montenegro Catholic University of Chile Santiago Dr. Robert Bye Dr. Rachel Mata National Autonomous University of Mexico	Dr. Scott Franzblau University of Illinois, Chicago Dr. Barbara Hutchinson University of Arizona Dr. William Maiese American Home Products

iors and drug use among adolescents in South Africa. South Africa has one of the highest rates of HIV infection in the world, and drug use among its youth increased during the 1990s. The main HIV risk behaviors being examined are engagement in sexual interactions with multiple partners and without a condom. The study is examining the following areas:

1. the relationship between HIV risk behaviors and drug use;
2. risk factors related to the “family interactional” model (the family, personality, peers, culture, demographics, and ecology) and factors related to this model that protect against HIV risk behaviors and drug use;
3. the role of social cognitive factors (theory of planned behavior) within the family interactional model in HIV risk behaviors and drug use; and
4. the shared and unshared risk factors for HIV risk behaviors and drug use.

For comparison, the research is being conducted in Durban and Cape Town, South Africa, which are located in the provinces with the highest and lowest rates of HIV infection, respectively. In assessing and comparing the risk and protective factors for each behavior, the study will shed light on potentially beneficial approaches for understanding and developing interventions for their prevention.

International Cooperative Biodiversity Groups

The contraction of natural habitats and, in particular, the destruction of species-rich tropical rainforests will have profound economic, social, and scientific consequences. In partnership with NIH research Institutes and other Federal agencies, FIC leads an interagency effort to promote economic development and ecological conservation through drug-discovery research on natural products. This initiative supports development of interdisciplinary research and building of research capacity through collaboration of U.S. institutions with institutions in developing countries to study important biological resources indigenous to the developing countries.

International Cooperative Biodiversity Groups (ICBGs) were established in FY 94 to discover new therapeutic agents for a broad range of human diseases and agricultural applications. The research areas include can-

cer, AIDS, Alzheimer’s disease, drug addiction, contraception, cardiovascular disorders, central nervous system disorders, bacterial and viral diseases, obesity and diabetes, tuberculosis, malaria, and leishmaniasis. Agents are derived from natural products found in numerous species of plants, fungi, and insects. Integrated into the research efforts are strategies to preserve biological diversity by developing knowledge for resource management and opportunities for local economic benefits from commercial development of discoveries. The projects supported by this program include the following:

- inventory and description of biodiversity;
- screening and description of biologically active organisms;
- study of the chemistry of natural products;
- research on traditional medicines and practices related to their use in indigenous cultures;
- comparison of modes of drug-discovery research; and
- training and career development for scientists and community participants from cooperating nations.

The three principal sponsors of the ICBG program—the NIH, the National Science Foundation, and the USDA Foreign Agricultural Service—jointly announced six new awards under this program in FY 98. Participating NIH Institutes, in addition to FIC, are NIAID, NCI, NIDA, NHLBI, and NIMH. Each of the six active ICBGs comprises diverse private and public institutions, including universities, pharmaceutical companies, and environmental organizations in 10 foreign countries (Table III-14). The cooperating organizations in an ICBG are linked by novel contractual agreements that address issues such as sharing of intellectual property and any financial benefits among the organizations and with conservation and community interests in the host country.

Since 1994, more than 8,000 species of plants, animals, and micro-organisms have been analyzed, yielding more than 400 compounds with biological activity in relevant therapeutic areas. The most active compounds against malaria, leishmaniasis, tuberculosis, infectious bacteria, and agriculturally important fungi are in development. For each ICBG, preserved biological speci-

mens are obtained and stored in at least one institution in the source country and one in the United States. Information on these specimens is recorded in geographic information systems and other computer databases in each country.

ICBG trainees include technicians, faculty, and graduate, postgraduate, and postdoctoral students. Training includes long-term study and work in degree programs, as well as short technical courses and workshops in biodiversity inventory, ethnobiology, chemistry, informatics, and intellectual property. Since 1994, more than 1,500 persons from 12 countries have received or are receiving training through ICBGs. This training also involves exchanges between universities and pharmaceutical companies in the United States and universities in the host countries.

Other efforts to build research capacity include equipment transfers to collaborators in the developing countries, both through government funding and directly from commercial partners. Commonly transferred laboratory equipment includes that related to the preparation, extraction, storage, and microbiological screening of specimens and the isolation and identification of chemical constituents. Equipment purchases include herbarium storage cases, computers, software, and field equipment to aid with description and management of biodiversity. Development of local infrastructure includes efforts such as the purchase of vehicles, renovation of laboratories and herbaria, and support of a medical clinic.

International Fellowships Bioethics Education and Career Development Award

In March 2000, FIC in collaboration with NIAID, the National Institute of Arthritis and Musculoskeletal and Skin Diseases, NICHD, NIDA, the National Institute of General Medical Sciences, NHLBI, and NINR established the International Bioethics Education and Career Development Award to support the development or expansion of current graduate curricula in international bioethics related to performing research in low- and middle-income nations. The award supports U.S. as well as international educational and research institutions for the following purposes:

1. to improve the quality of international training in ethics by supporting develop-

TABLE III-15.**International Research Scientist Development Awards by Region and Country, Fiscal Year 2000**

Region/Country	No.
Africa	4
Cameroon	1
Malawi	1
South Africa	1
Uganda	1
Latin America	4
Mexico	2
Brazil	1
Haiti	1
TOTAL	8

ment of courses to provide skills for teaching and research related to bioethics and the conduct of medical research in developing countries;

2. to support the advanced training of professionals in developing countries who can assume the roles and responsibilities of bioethicists involved in ethical review of the design of clinical trials in their countries; and

3. to develop and provide intensive short courses designed for professionals who are directly involved in ethical review of research on human subjects.

In FY 00, full awards under this new program were made to four U.S. and one Canadian university, and planning grants were made to institutions in Chile and South Africa.

International Research Fellowship Program

The International Research Fellowship (IRF) Program, established in 1958, is the oldest FIC Program, predating the establishment of FIC. Over its history, the IRF Program has accomplished its initial objective of helping to rebuild the science base in many European institutions after World War II and has contributed to the development of global research capacity in the biomedical sciences. In FY 95, the Program was restructured to emphasize research training for scientists from low- and middle-income countries. This Program has proved to be effective in enabling U.S. universities to benefit from an international talent pool of postdoctoral researchers. Of equal importance, the scientific

partnerships established have frequently extended beyond the duration of the award. Since its inception more than 40 years ago, more than 3,000 foreign scientists have been trained through the IRF Program.

Because of the steady expansion of FIC programs that provide postdoctoral research experiences in the United States for scientists from low- and middle-income countries, as well as opportunities for research collaboration under the FIRCA program, FIC will no longer accept applications for the IRF Program. Investigators who hold fellowships under this Program will continue to be supported for the duration of the fellowship projects. In FY 00, the IRF Program supported eight postdoctoral researchers from seven countries.

International Research Scientist Development Award

FIC established the International Research Scientist Development Award in FY 99 to encourage U.S. postdoctoral biomedical scientists who are in the formative stages of their careers to continue research in, or extend their research experience to, developing countries. The program provides funding for a period of mentored research as part of a strong, established collaboration with a U.S. sponsor and a leading scientist in a developing country, at an internationally recognized research institution. After this experience, the awardee will be able to pursue an independent and productive international research career that involves ongoing collaboration with scientists in developing countries, to more effectively conduct research relevant to stemming a major global health problem. Four initial awards were made in FY 99 to scientists engaged in research in Cameroon, Haiti, Mexico, and Uganda. In FY 00, four additional awards were made to scientists for work in Brazil, Malawi, Mexico, and South Africa (Table III-15). Some examples of studies for which awards were funded in FY 00 are presented here.

A researcher, working with mentors at the Southwest Foundation for Biomedical Research, San Antonio, Texas, and Centro de Pesquisas Rene Rachou, Belo Horizonte, Brazil, is studying the influence of host genetics on the immune response to helminthic coinfection in persons with HIV in Brazil. He is examining the cellular im-

mune response of residents in an area where *Necator americanus* and *Schistosoma mansoni* are endemic and is conducting a longitudinal study. The aims of the research are (1) to develop extended multihousehold pedigrees for the residents of the endemic area; (2) to identify cellular immune responses associated with helminthic and HIV coinfection, by using flow cytometric analysis before and 1 year after antihelminthic treatment; and (3) to determine how much of the variation in these cellular immune responses is due to genetic, systemic environmental, or random environmental factors.

An investigator working with mentors at Cornell University Medical College, New York, and the NIH-funded Cornell GHESKIO unit in Port-au-Prince, Haiti, is studying factors that affect resistance to HIV in Haiti. The research is based on two hypotheses: (1) The incidence of HIV heterosexual transmission among couples who are discordant for HIV infection is greatest in the early postinfection period. (2) Spouses who are persistently seronegative for HIV despite frequent exposure are protected from infection by innate or acquired host factors. The investigator has begun to constitute and characterize a cohort of HIV-discordant couples in which the index partner was recently infected. The purposes of the study are to determine the incidence of HIV infection in the HIV-seronegative spouses and to characterize innate and acquired factors that contribute to host resistance in the exposed but uninfected partners. Two potential factors under study are CCR5 promoter mutations and genital mucosal IgA. Preliminary studies of spouses of HIV-infected persons who are persistently seronegative for HIV despite frequent exposure have identified a mutation of CCR5 promoter that reduces in vitro transcription of CCR5, thereby potentially protecting against HIV infection. This mutation appears to be unique to persons of African descent. Determination of the period of greatest risk for HIV heterosexual transmission in HIV-discordant couples will permit the targeting of limited intervention resources (condoms, antiretroviral agents, counseling, and screening for STDs) to these persons. These data, together with a better understanding of innate and acquired host resistance, will also be essential for the optimal design of efficacy trials of HIV vaccine.

TABLE III-16.**Senior International Fellowship Awards by Region and Country, Fiscal Year 2000**

Region/Country	No.
Europe	19
France	9
United Kingdom	6
Germany	1
The Netherlands	1
Spain	1
Sweden	1
Asia, India, and Middle East	2
Israel	2
Africa	1
South Africa	1
Pacific	1
Australia	1
TOTAL	23

Senior International Fellowship

The Senior International Fellowship Program was established in 1975 to provide opportunities for mid- and senior-career-level U.S. scientists to undertake biomedical research studies at foreign institutions. Since the inception of the Program, more than 879 U.S. scientists have undertaken fellowships abroad, mainly in Western Europe. In FY 00, Senior International Fellowship Awards supported 23 investigators to start projects in nine countries (Table III-16). Examples of the work supported by the Senior International Fellowship Program are presented here.

A scientist from the Keck School of Medicine, University of Southern California, Los Angeles, collaborated with colleagues at the University of Stellenbosch, Cape Town, South Africa, to establish a registry of childhood cancer for Western Cape Province and South Africa as a whole and to conduct descriptive studies of childhood cancer in the Western Cape. The goal is to compare the incidences of leukemia and other cancers among children living close to Africa's only nuclear power plant, the Koeberg facility, with the incidences among children living in other areas of the province. Those data are being analyzed. The scientists also updated and are analyzing a survey of childhood brain tumors among tribes in Namibia. The U.S. scientist also served as a consultant to a number of projects in the pediatric department at the University of Stellenbosch, in-

cluding (1) a large cohort study of tuberculosis among the Cape colored; (2) efforts to reduce vertical transmission of HIV to infants born to HIV-positive mothers; and (3) development of an improved scale for determining which infants should be assigned to the few beds in the neonatal intensive care unit. Finally, the work done under this Senior International Fellowship Program award is facilitating future collaboration between the University of Stellenbosch and the Keck School of Medicine, University of Southern California.

IN-HOUSE RESEARCH

In FY 00, FIC created the Division of International Epidemiology and Population Studies to design and conduct in-house research in the fields of epidemiology and population-based studies. The Division has two core activities: (1) translation and adaptation research, which examines the barriers to the application of health science knowledge to interventions that may benefit diverse populations and (2) application of new tools in epidemiologic research to diverse populations. The Division will design and conduct studies to examine factors that affect the application of advances in health science, particularly for the benefit of populations in developing countries. In these studies, information from epidemiologic, demographic, and mathematical modeling is used to identify effective and cost-effective strategies to improve health.

ADVANCED STUDIES

In FY 00, FIC also established the Division of Advanced Studies and Policy Analysis (DASPA). The Division plans and coordinates studies of national and international importance that are relevant to the programmatic and policy directions of the Center and that complement the research activities of the NIH Institutes. It also advises the FIC Director on international science policy issues; development of strategic and operational plans; and development, analysis, and evaluation of the Center's programs. Selected DASPA activities undertaken in FY 00 are noted here.

Program Development

DASPA has developed an RFA to a grant program on International Studies on Health and Economic Development. This new pro-

ject, slated for funding in FY 01, will be cofunded with several other NIH components and, for the first time for FIC, in collaboration with the World Bank. To undertake this first-time examination by the NIH of the relationship between health and economic growth, FIC constructed a broad program to support research on a range of issues relating health status to economic productivity.

DASPA staff also led the development of an International Tobacco and Health Research and Capacity Building Program, which will be funded in FY 01. This Program will be cofunded in FY 01 by NCI, NICHD, NIDA, NIMH, and NINR. It will address the growing incidence of tobacco-related illness and death and the burden of tobacco consumption in developing nations.

Bioethics

DASPA staff are leading the formulation of an NIH response to an international report drafted by the National Bioethics Advisory Commission. The Division also took the lead in preparing an NIH response to a revision of the 1993 International Ethical Guidelines for Biomedical Research Involving Human Subjects, of the Council for International Organizations of Medical Sciences.

DASPA staff organized and participated in several meetings to discuss a variety of issues related to biomedical research ethics. One meeting was held at the NIH, in Bethesda, Maryland, to discuss new international guidelines for ensuring adherence to ethical standards in research. The aims of the meeting were (1) to obtain comments on a draft document developed by the NIH Office of Protection From Research Risks that would guide ethical review of publicly funded research conducted abroad and (2) to discuss plans for future meetings, including the 2nd Global Forum on Bioethics in Research, to be held in Bangkok, Thailand, in October 2000.

DASPA also initiated and organized a conference on Biomedicine and the Media to discuss the ethics and responsibility of the media in reporting science, which was held in Bethesda, Maryland, in June 2000. The conference was attended by editors of medical journals and members of the press, including correspondents from developing countries (see section on "International Meetings"). In addition, DASPA staff helped to organize the Symposium on Internation-

al Research Ethics for the NICHD consultation meeting, to be held in Gaborone, Botswana, in March 2001, and the NIDCR Satellite Research Ethics Symposium for the meeting of the International Association of Dental Research, to be held in Chiba, Japan, in June 2001.

INTERNATIONAL RELATIONS

FIC promotes collaboration in biomedical and behavioral sciences between the NIH and researchers worldwide through various mechanisms. For example, FIC staff help to develop and administer international agreements and other policy initiatives in efforts to advance the global health agenda. Moreover, FIC helps to facilitate the dissemination and exchange of scientific information and establish informal mechanisms of cooperation. The Center also serves as the NIH liaison with the U.S. Department of State and international components of other Federal agencies, international organizations, and foreign governments, as well as other partners, including nongovernmental organizations.

Egypt

Under the 1995 U.S.-Egypt Science and Technology Agreement, the U.S. Department of State and the Egyptian Ministry of Higher Education and Scientific Research provide funds for activities of the U.S.-Egypt Joint Science and Technology Board. FIC, together with the Office of Refugee and International Health, represented the U.S. Department of Health and Human Services (DHHS) at the annual meeting of the U.S.-Egypt Joint Board, in Washington, D.C., in May 2000. The Board approved six grant proposals in the field of health and biotechnology and support for a workshop on Conservation and Sustainable Use of Biodiversity in Egypt. The workshop, which will focus on potential biomedical compounds in natural products from marine life in the Red Sea and desert plants, will be held at Mansoura University in the Delta, on April 3–5, 2001. FIC and NCI's Division of Natural Products will participate in organizing the meeting.

India

In June 2000, the Secretary of Health and Human Services and the Indian Minister of Health and Family Welfare signed a Joint Statement on HIV/STD Prevention Research.

This statement was negotiated by the Indian Council of Medical Research and FIC, working with the NIH Office of AIDS Research, NIMH, NIAID, NIDA, and NICHD. The goal of the agreement is to promote new collaboration between U.S. and Indian scientists in the field of HIV/AIDS research, including behavioral and biomedical research, vaccine development and testing, and STD-related studies.

In preparation for the Joint Statement, FIC and the Indian Council of Medical Research organized a meeting in Chennai, India, in January 2000, to examine the state of cooperation on HIV/AIDS prevention research between the United States and India. Working groups discussed primary research questions in four areas: behavioral prevention, other methods of biomedical prevention, development of HIV vaccine, and vertical transmission of HIV. Each group will work to identify the collaborative research efforts needed and the gaps in research infrastructure, training, communication, and coordination.

Italy

In April 2000, FIC joined a delegation of U.S. Government technical agencies led by the Department of State, which participated in the 6th U.S.-Italy Science and Technology Review meeting and related site visits in Italy. The DHHS delegation comprised the six U.S. representatives of the Working Group on Health and Biomedicine, who were from the NIH—the Office of the Director, the National Institute on Alcohol Abuse and Alcoholism, NIAID, NHLBI, and FIC. Italian representatives of the working group included colleagues from Istituto Superiore di Sanità; the Network of Institutes of Research and Care, of the Ministry of Health; and the Italian National Research Council. This group reviewed the progress and status of joint projects in priority research areas, including infectious diseases, cancer, aging, child health, cardiovascular and pulmonary disease, women's health, nuclear medicine, and biomedical informatics.

Japan

The Deputy Directors of FIC, the National Institute on Aging, and the National Human Genome Research Institute (NIH) participated in the meeting of the U.S.-Japan Joint High-Level Committee on Science and Tech-

nology, in Washington, D.C., on May 1–2, 2000. A high-level panel presented a review of the bilateral science and technology relationship in the new millennium; the review was commissioned by President Bill Clinton and Prime Minister Keizo Obuchi. Staff from FIC and the Japanese Science and Technology Agency conducted the meeting of the Life Sciences Liaison Group (LSLG), in Washington, D.C., on April 28, 2000, and reported to the joint high-level committee through the working-level committee. USDA, the National Institute of General Medical Sciences (NIH), and the Genomic Sciences Center, of the Institute of Physical and Chemical Research (RIKEN), Japan, participated in the LSLG meeting and described ways in which research efforts in structural genomics in the United States and Japan might be mutually supportive. The Japanese scientists presented 40 new proposals for consideration by LSLG, 16 in agriculture and 24 in health-related research areas.

The 3rd U.S.-Japan Gene Therapy Conference was held in Bethesda, Maryland, on February 24, 2000. Leadership was provided by the Center for Biologics Evaluation and Research, the U.S. Food and Drug Administration (FDA), and the faculty of leading Japanese universities. The Japanese Ministry of Education, Science, Sports, and Culture has contributed to the support of this project under LSLG for the last 10 years.

Latin America and the Caribbean

The Pan American Fellowship program, originally a product of a bilateral cooperative agreement between the United States and Mexico, brings postdoctoral candidates to NIH intramural laboratories to train for a period of 1–2 years. FIC worked throughout 2000 to expand this program by including other qualified science and technology funding agencies, universities, research institutes and other foundations, and regional and international organizations in Argentina, Chile, Colombia, and Uruguay. In addition, the Pan American Health Organization (PAHO) recently joined FIC in supporting scientists and researchers from less developed countries in Latin America (i.e., the Andean region, the Caribbean, and Central America).

FIC partnered with the Latin American Network of Biological Sciences, the Latin American Academy of Sciences, and the

Mexican National Council of Science and Technology (CONACYT) to organize a Pan American Symposium on the Molecular Approach to Human Diseases. The symposium, to be held in Mexico City, Mexico, in November 2000, will include intramural and extramural scientists from six NIH Institutes and Centers and from eight countries in Latin America and the Caribbean.

In May 2000, FIC represented the NIH as part of the U.S. delegation at the 17th annual meeting of the high-level U.S.-Mexico Binational Commission, which was held at the Department of State, Washington, D.C. The conference set forth five priority areas for U.S.-Mexico science and technology cooperation: biocomplexity, environmental sciences, science education and research, substance abuse, and infectious diseases. The meeting also underlined the importance of bilateral cooperation in the areas of health and science and technology and recognized the NIH-CONACYT Cooperative Agreement as a model for effective partnerships between the United States and Mexico.

FIC also represented the NIH at WHO's Executive Council for Research in the Americas, which met in Havana, Cuba, in July 2000. The meeting provided an opportunity for all participants to identify and present specific recommendations to PAHO on priorities and new objectives in biomedical and behavioral research in the Americas. FIC provided an overview of its activities in cooperative biomedical research, with emphasis on some of the new training and capacity-building initiatives related to Latin America and the Caribbean.

Russia

The NIH participated in two committees under the U.S.-Russia Joint Commission on Economic and Technological Cooperation, and FIC coordinated NIH efforts under both the Health Committee and the Science Committee. Under the auspices of the Health Committee, NIH Institutes and grantees have collaborated with Russian counterparts in addressing numerous priority issues related to public health research and disease prevention and education. The most recent areas of cooperation include cardiovascular disease, alcohol abuse, and mental health. NIH activities under the Science Committee occurred largely through efforts with the U.S. Civilian Research and

Development Foundation (CRDF). In addition, NIAID and FIC participated in a new interagency, bilateral working group established under the Science Committee to explore mutual interests and opportunities in research on infectious disease.

At the initiative of the U.S. Department of State and the U.S. Department of Defense and as part of a broad-based effort to engage former defense scientists from Russia and other NIS countries, the pilot DHHS Biotechnology Engagement Program began its support of public health-oriented collaborative research projects and research training, primarily in infectious diseases. The Program includes DHHS partners (NIH, CDC, and FDA) and the multilateral International Science and Technology Center, and it integrates other public health assistance and collaborative efforts involving the Russian Ministry of Health; the Ministry of Industry, Science, and Technology; and leading NIS biomedical research institutions.

South Africa

In FY 00, FIC continued to serve as the NIH focal point for coordination of medical research activities under the binational commission spearheaded by former Vice President Al Gore and President Thabo Mbeki. FIC worked to provide information to South African researchers and institutions on an array of opportunities for joint research. The Health Working Group of the Gore-Mbeki Binational Commission will meet in Pretoria, South Africa, in November 2000, to discuss ongoing joint activities and explore new opportunities for collaboration. NIAID and NIMH are among the NIH Institutes that will participate in the meeting.

Representatives of DHHS signed a Memorandum of Understanding with the Medical Research Council of South Africa, on May 23, 2000, to promote cooperation in the fields of public health and biomedical and behavioral research. FIC played a major role in drafting and facilitating the agreement. The NIH is also a major implementing agency for activities to be conducted under the Memorandum of Understanding and works closely with the Medical Research Council. Collaborative research efforts continue in the areas of HIV/AIDS, mental health, fetal alcohol syndrome, telemedicine, and violence.

One postdoctoral fellow from the Univer-

sity of Cape Town was selected to work on exploration of malaria genetics and development of vaccine in NIAID's Laboratory of Parasitic Diseases, under the NIH's Visiting Scientist Program. This selection followed a commitment made between the president of the University of Cape Town and DHHS, in 1997, to increase training opportunities at the NIH for scientists and researchers at the university.

Spain

FIC represented the NIH at the 3rd meeting of the U.S.-Spain Joint Science and Technology Board, in Madrid, in April 2000. Preparatory to the meeting, representatives of the United States and Spain reviewed proposals for the third and last round of competition for funding by the U.S.-Spain Joint Fund. FIC coordinated the NIH review of all proposals related to life sciences and biomedicine. Thirteen of the 60 grants awarded were for research in the life sciences, including infectious diseases and molecular design of pharmaceuticals.

Ukraine

FIC represented the NIH in the annual meeting of the U.S.-Ukraine Science and Technology Working Group of the Gore-Kuchma Commission, which held its first meeting in November 1996. The working group strives to promote cooperation in science and technology, including biomedical research, primarily through joint efforts by CRDF and the Science and Technology Center of Ukraine. In addition, the working group, which includes participation by NCI, NIEHS, NIMH, and FIC, provides a forum for ongoing exchange and dissemination of information on programs in the United States and Ukraine, research capabilities, government priorities, and opportunities for joint research efforts. Collaboration has focused on the multitude of long-term health effects related to the 1986 nuclear power plant accident in Chernobyl.

MULTILATERAL ACTIVITIES

Multilateral Initiative on Malaria

In FY 99, FIC assumed the role of Secretariat for the Multilateral Initiative on Malaria (MIM), an alliance of organizations and individuals committed to advancing malaria research and control efforts. Building on the work begun by the Wellcome Trust, the first

TABLE III-17.**Visiting Program: Rank Order by Country and Area, for all Institutes of the National Institutes of Health, Fiscal Year 2000^a**

>10 Person Country/Area	No.	5-10 Persons Country/Area	No.	<5 Persons Country/Area	No.
China	423	Belgium	10	Belarus	4
Japan	359	Philippines	10	Jamaica	4
Korea	217	Ukraine	10	Kenya	4
India	157	Sweden	9	Nigeria	4
Canada	145	Ireland	8	Peru	4
Italy	139	Serbia-Montenegro	8	Romania	4
Russia	126	Colombia	7	Algeria	3
Germany	123	Chile	6	Bangladesh	3
France	110	Croatia	6	Iran	3
United Kingdom	92	Egypt	6	Mongolia	3
Spain	65	Pakistan	6	Venezuela	3
U.S. permanent residents	63	Singapore	6	Estonia	2
Israel	58	Thailand	6	Liberia	2
Australia	38	Jordan	5	Mali	2
Taiwan	37	Lebanon	5	Portugal	2
Poland	35	Malaysia	5	Albania	1
The Netherlands	31	Morocco	5	Armenia	1
Argentina	27	South Africa	5	Bahamas	1
Brazil	27			Cambodia	1
Hungary	25			Cuba	1
Mexico	19			Cyprus	1
Czech Republic	18			Ethiopia	1
Slovakia	18			Fiji	1
Turkey	17			Georgia	1
Greece	16			Iceland	1
Finland	13			Indonesia	1
Austria	12			Kazakhstan	1
Bulgaria	12			Latvia	1
Denmark	11			Macedonia	1
New Zealand	11			Norway	1
Switzerland	11			Paraguay	1
				Senegal	1
				Slovenia	1
				Sri Lanka	1
				Syria	1
				Tanzania	1
				Tunisia	1
				Vietnam	1
				Zimbabwe	1

^aTotal of 2,649 persons from 88 countries or areas. Includes 22 persons from Center for Biologics Evaluation and Research, U.S. Food and Drug Administration.

MIM Secretariat, FIC is continuing to enhance MIM's leadership role in addressing and coordinating efforts in scientific research against malaria in countries where it is endemic.

In FY 00, the MIM Secretariat worked with the African malaria research community to develop the African Leaders Training Program, to develop leadership and management skills in the professionals who will direct malaria research institutions in Africa. After a series of meetings to refine the program's goals, the first workshop took place in Oxford, England, in September 2000. In addition, the Secretariat organized and will run workshops on the writing of grant proposals and the mechanics of peer review, in

November 2000.

MIM also acts to identify gaps in malaria research. Anemia is a major outcome of malaria infection and a major cause of death, but the mechanisms of this anemia are poorly understood. In May 2000, together with NIAID and NHLBI, MIM sponsored a workshop on the Pathogenesis of Malarial Anemia, in Bethesda, Maryland. At this meeting, malaria investigators identified the need to collaborate with hematologists. MIM will also hold a symposium on malaria-induced anemia, at the American Society for Hematology, in San Francisco, California, in December 2000, to encourage collaborations.

The MIM Secretariat facilitates informa-

tion exchange between malaria researchers in the North and South and supports MIM-funded scientists to attend major international conferences. The Secretariat organized a MIM-TDR Symposium that will be held at the Annual Meeting of the American Society of Tropical Medicine and Hygiene, in Houston, Texas, in November 2000, to publicize the work of grantees.

Europe

In May 2000, President Clinton and European Union President Romano Prodi issued a Joint Statement on Communicable Diseases focusing on HIV/AIDS, tuberculosis, and malaria in sub-Saharan Africa. FIC staff represented the NIH in the negotiations of the agreement and traveled to Brussels, Belgium, in July 2000, to begin the development of activities under the Joint Statement.

Also in May 2000, the FIC Deputy Director represented the NIH as an observer at the annual meeting of the European Medical Research Councils. An overview of FIC and NIH activities was provided, along with a discussion of planned initiatives.

U.S. Civilian Research and Development Foundation

CRDF is a nonprofit, private foundation that was established in August 1995 by the U.S. Government to facilitate scientific and technical cooperation between the civilian sector in the United States and NIS and to support the science and technology infrastructure. Since 1996, the NIH's total contribution to CRDF of \$4.3 million has successfully leveraged another \$2.5 million from other sources, to support more than 130 collaborative research projects in the biomedical and behavioral sciences, as well as workshops and travel awards for development of research proposals. At least 80% of each award directly supports expenses of the team from NIS, including salary, travel, equipment, and supplies, providing critical support to sustain biomedical research in that region.

The NIH Office of AIDS Research, NIAID, and FIC cooperated with CRDF to organize a joint international symposium to review major achievements of the 1997-1999 CRDF Biomedical and Behavioral Sciences Program. The meeting, which featured presentations by five U.S.-NIS teams of scientists, was held in Moscow, Russia, in May 2000. In

conjunction with this symposium, the NIH partners conducted a grantsmanship workshop that brought together current U.S. and NIS grantees and interested investigators to build on and sustain collaboration in research on emerging infectious diseases.

Human Frontier Science Program

The Human Frontier Science Program (HFSP), based in Strasbourg, France, supports international collaboration and research training through grants and fellowships for basic research in the life sciences. The Program was proposed by the Japanese Prime Minister at the Economic Summit of the G7 nations in 1987 and was developed and implemented in coordination with the G7 countries in 1989. All the G7 countries contribute to the Program, along with the European Union and Switzerland, but Japan remains the largest contributor. The NIH contributes annually to HFSP. Examples of current multilateral research projects are presented here.

Mammals are exquisitely sensitive to a wide range of odors, but the mechanisms of olfactory processing have remained elusive. A team of scientists from the United States, Germany, and Japan has carried out a concerted effort to reveal the mechanisms that control the encoding and transmittal of olfactory information. The scientists have used a combination of methods from genetics, chemistry, electrophysiology, and fluorescence imaging to elucidate the natural ligands for a group of odorant receptors and to define the cellular interactions in the olfactory pathway that account for the sensitivity of mammals to such a wide repertoire of odors. Their results show that olfactory processing depends on both the properties and localization of olfactory receptors and the cellular organization of the neurons in the olfactory pathways.

Spatial memory, which is processed in the hippocampus, involves components of orientation and memory of events, which have been ascribed to different mechanisms. A team of investigators from Italy, the United Kingdom, and the United States measured the electrical activity of hippocampal neurons and applied novel theoretical approaches by using information theory to elucidate the relationship between these two aspects of spatial memory. The investigators found that, in contrast to previous ideas,

TABLE III-18.
Guest Researchers: Rank Order by Country and Area, for All Institutes of the National Institutes of Health, Fiscal Year 2000^a

>10 Person Country/Area	No.	5-10 Persons Country/Area	No.	<5 Persons Country/Area	No.
Japan	17	Italy	7	Canada	4
		Germany	6	Korea	4
		China	5	Israel	3
				Taiwan	3
				Denmark	2
				France	2
				The Netherlands	2
				United Kingdom	2
				Argentina	1
				Belgium	1
				Burkina Faso	1
				Chile	1
				Czech Republic	1
				Ethiopia	1
				Mexico	1
				Norway	1
				Peru	1
				Russia	1
				Spain	1
				Switzerland	1
				Thailand	1

^aTotal of 70 persons from 25 countries or areas.

both spatial and event information are integrated by a single network of cells.

Duplication and segregation of genetic information are two of the most fundamental events in cell reproduction, and DNA repair machinery is important to cellular maintenance of the integrity of genetic information. Execution of these processes requires faithful reorganization of higher-order chromosome structure, because errors in these processes can lead to tumor progression or birth defects. A multidisciplinary team from the United States, Austria, and Switzerland is examining the “structural maintenance of chromosomes” family of adenosine triphosphatases that have recently been shown to play a critical role in sister chromatid cohesion. The researchers have identified a number of new family members including (1) cohesin subunits, which appear to be responsible for sister chromatid cohesion, and (2) a new DNA polymerase that appears to be associated with replication fork passage necessary for cohesion between sister chromatids and separin, a conserved protein essential for chromatid separation.

Because genetic information is stored in the nucleus and cellular activities take place in the cytoplasm, transport through the nu-

clear membrane is extremely important. To understand the nucleocytoplasmic transport through nuclear pores at the molecular level, a research team from the United States, Germany, Japan, Switzerland, and the United Kingdom has been characterizing the structure of the nuclear pore. Using an interdisciplinary approach that combines novel technologies, such as atomic force microscopy and fluorescence resonance energy transfer in living cells, complemented by functional and biochemical analysis, the team has characterized protein-protein interactions involved in directional transport of macromolecules through nuclear pores. The structural and functional studies have produced new insights into how transport cargos are targeted to and translocated through the nuclear pore structures.

An international team from the United States, France, Germany, the Netherlands, and the United Kingdom is identifying the interplay of transcription factors in regulation of gene expression, cell growth, and differentiation. Their target is TFIID, a multiprotein complex consisting of the TATA binding protein and associating factors. The scientists have determined that the composition, organization, and structure of TFIID

TABLE III-19.**Special Volunteers: Rank Order by Country and Area, for All Institutes of the National Institutes of Health, Fiscal Year 2000**

>10 Person Country/Area		5-10 Persons Country/Area		<5 Persons Country/Area	
No.	No.	No.	No.	No.	No.
Japan	90	Brazil	9	Iran	4
Germany	38	Denmark	9	Mexico	4
China	34	Spain	9	Switzerland	4
Korea	26	United Kingdom	9	Argentina	3
Italy	24	Sweden	8	Chile	3
Russia	16	Turkey	8	Peru	3
India	14	Australia	7	Philippines	3
The Netherlands	14	Israel	6	Poland	3
Taiwan	13	Portugal	5	Slovakia	3
Canada	11			Thailand	3
France	11			Algeria	2
				Austria	2
				Belgium	2
				Egypt	2
				Finland	2
				Greece	2
				Hungary	2
				New Zealand	2
				Romania	2
				Bangladesh	1
				Bosnia-Herzegovina	1
				Croatia	1
				Czech Republic	1
				Gabon	1
				Iceland	1
				Jordan	1
				Macedonia	1
				Madagascar	1
				Niger	1
				Norway	1
				Pakistan	1
				Serbia-Montenegro	1
				Sierra Leone	1
				Trinidad and Tobago	1
				U.S. permanent residents	

^aTotal of 428 persons from 55 countries or areas.

are highly conserved from yeast to human, and they have identified a new associating factor, which may play a key role in understanding the organization of TFIID. Using this factor and others, the scientists are attempting to reconstruct the complex from its components.

In addition to grants, HFSP provides support to young investigators who want to undertake research training abroad. During FY 00, the duration of the fellowship was increased from 2 years to 3 years. The third year of support can be used either in the home country or in the host laboratory. If the third year is used for repatriation, it can be deferred for up to 3 years while the investigator is receiving other funding support.

An HFSP fellow of Canadian and Egyptian nationality working at New York University, New York, demonstrated that storage and retrieval of long-term memories are surprisingly unstable. He discovered that each time long-term memories are retrieved, they become chemically labile, because new protein synthesis must occur for them to be stored. This process opens opportunities for memories to be altered or disrupted, thus providing a biological basis for phenomena such as false-memory syndrome.

Membrane proteins are difficult to crystallize, and as a result, only a few high-resolution structures have been solved by x-ray crystallography. A German fellow working at the University of California, San Francisco,

has developed a new micromethod for cubic phase methodology for crystallizing membrane proteins.

An investigator from New Zealand working at CDC has been studying molecular mechanisms associated with the ability of the malaria parasite to invade red blood cells. By sequencing genes related to adhesion of the merozoite to the red blood cell membrane, he identified a highly conserved gene sequence that codes for a protein associated with adhesion and signaling early in the invasion process.

HFSP also provides funds for short visits to establish new collaborations or to learn new techniques. A short-term HFSP fellow from Italy, who is working at Virginia Commonwealth University, Richmond, identified interactions in appetite control by both leptin and endocannabinoids. This finding provides a basis for possible new approaches to development of agents to treat obesity. Using mice that are deficient in endocannabinoid leptin receptors, the researcher demonstrated that food intake could be experimentally modified by altering the levels of anandamide administered to the mice. This result suggests that endogenous endocannabinoids in the hypothalamus are involved in the tonic control of food intake and are part of the neural circuitry regulated by leptin.

NIH VISITING PROGRAM

Since 1968, FIC has provided administrative and immigration-related support for foreign scientists in the NIH's intramural research laboratories and at FDA's Center for Biologics Evaluation and Research (CBER), principally under the NIH Visiting Program, the Guest Researcher Program and the Special Volunteer Program.

Established in 1950, the Visiting Program brings talented foreign scientists to the NIH to work or train with senior NIH investigators. A Program participant must be invited to the NIH by a senior intramural investigator who will sponsor the visitor's research.

In FY 00, immigration-related support services were provided for 2,627 scientists at the NIH and 22 at CBER, a total of 2,649 scientists from 90 countries, under the Visiting Program. All these fellowships were funded in full or in part by the NIH Institute or Center in which the foreign scientist conducted the research or by CBER.

Guest Researchers and Special Volunteers are supported financially by their home institutions, foreign and domestic organizations, or both. Guest Researchers are independent scientists conducting their own research at NIH facilities. During FY 00, there were 70 Guest Researchers from 25 countries. Special Volunteers work in collaboration with and under the direction of an NIH sponsor. During FY 00, there were 428 Special Volunteers from 55 countries.

Tables III-17 through III-19 illustrate the distribution of foreign scientists by country.

INTERNATIONAL CONFERENCES, LECTURES, AND CONSULTATIONS

Another role of FIC is to bring together scientists from many parts of the world to confer and to explore health issues of worldwide significance. For these purposes, FIC supports conferences, seminars, meetings, and workshops. In addition, FIC works with international and domestic partners to develop approaches for addressing critical

needs for global health and biomedical research. Some of the international meetings in FY 00 are described here.

FIC will cosponsor the 2nd Global Forum on Bioethics in Research, to be held in Bangkok, Thailand, on October 14–15, 2000. The meeting will be the second in a series on this subject; the series was launched by FIC in FY 99. Hosted by WHO, the meeting will focus on the responsibilities of the sponsor and researcher to the host community and on whether increasing these responsibilities is good research policy. FIC worked with NIH partners to support participation of scientists from developing countries in the meeting.

In consultation with the World Bank, WHO, and several NIH Institutes, FIC organized the Conference on Health and Economic Development, which was held at the NIH, in Bethesda, Maryland, on November 15–16, 1999. Economists including three Nobel laureates, public health experts including staff of the World Bank, WHO, foundations, the research community, and rep-

resentatives of health and finance ministries of developing countries examined correlations between health and economic welfare and methodological and empirical needs to quantify these relationships. The objective of the conference was to inform the development of a grant program in this area.

FIC sponsored the conference on Biomedicine and the Media: An International Colloquium, in Bethesda, Maryland, on June 7, 2000. The 24 participants included medical editors, print journalists, researchers, a social historian, a representative of the NIH Office of Communications, and 6 participants from developing countries. They gathered at the NIH for a 1-day discussion on issues that relate to science, the media and ethics, and the challenges of communicating science to the public. The goal of the consultation was to determine how wide the gap may be between researchers and the media and whether there are issues that FIC should pursue to narrow this gap and to achieve more responsible and accurate reporting of research.